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The American Society of Civil Engineers.

At the annual meeting of the American Society of Civil Engineers this week two important subjects were brought up. One of these did not call for action by the members directly, as it was in the hands of the Board of Direction. It related to the enlargement of the Society's house, which is necessary in order that all unusually large meetings like that of this week may be held under the roof-tree of the organization. Land for the extension has been purchased and provision made for funds to carry out the work. This action by the Board meets the only serious objection ever raised against the present house, its lack of room to accommodate comfortably the meetings and receptions which occur once a year at the annual business gathering of the members. For all other purposes the house is more than ample for many years to come, and the action of the Board in removing the sole objection to it indicates their belief that the members of the Society desire to have the building complete in every respect for all its purposes. In view of all that has been said in the past for and against this building, it will be generally admitted that this action by the Board was not only a shrewd business move, but also a desirable step in carrying out the independent policy regarding its home which was established by a two-to-one vote a year ago.

The second subject which came up at the meeting was the policy of the Society concerning nominating persons to serve on important public commissions. It was introduced by Mr. Samuel Whinery, a former vice-president and director of the body, who is presumably acquainted, in consequence of holding such offices, with the unwritten laws of the organization. He introduced a resolution calling upon the Board of Direction to make an investigation of the subject and report at the next annual meeting, a year hence. Naturally enough, the resolution brought out much discussion. For a time it looked as though the purpose of the resolution would be overlooked and the debate pass into a discussion of the general subject of making nominations, but finally it was voted to refer the matter to the Board as suggested by Mr. Whinery.

There can be little question that this step was a wise one. The American Society of Civil Engineers is rising rapidly in public estimation, and it is but natural for high public officials to turn to it as the recognized head of civil engineering for suggestions concerning the best men to place on important commissions. This is a tendency which must develop with the growth of the Society, and the Board of Direction should be in a position to answer promptly all such requests along the line of a policy established by the members after mature deliberation. As President Hermany well said, the subject was one of the most important that had come up in the Society's history, and should not be settled hastily, without giving all members, wherever they may be located, an opportunity to express their views.

As a matter of fact the Society or its directors did establish a policy many years ago, but it was so far back that only Mr. J. J. R. Croes and Mr. John Bogart could recall it. It has, of course, been felt in a general way, as a sort of a tradition from the stone age of the organization, that the Society must not do anything to help anybody looking for an engineer for any purpose, public or private, lest it seem thereby to rank one member higher than another. It may be said that this is probably the view held by the majority of the older men, while that of the majority of the younger members is that the Board of Direction should make or refuse to make such nominations, as its best judgment indicates. There is a very great difference of opinion on the subject, and the only way to settle the matter satisfactorily with due regard to the views of all, is to follow the course adopted this week at Mr. Whinery's suggestion.

Merely as a matter of information and without intending to influence in any way the action of the members of the Society on a matter which is peculiarly personal to them, it may be stated that from time to time inquiries reach this journal as to the probability that the Society would suggest suitable members for public commissions. These inquiries are made in confidence, because they relate to commissions which must be announced to the public, when anything is stated about them, as fully appointed bodies. Such inquiries have always been met by referring the maker to the Society, yet so far as this journal is aware, the Society has not been approached in any case. On several occasions in the last two years the Society could have been of distinct public service had it any well-known policy in such matters. The purpose of the Society is to advance the interests of engineering, and whether that purpose includes assisting public officials to secure the best men for public commissions is for the members to determine. From the point of view of the public, such assistance would be of material value, but whether it is for the best interests of the Society itself to give it is another matter which is full of difficult situations.

The Commercial Value of Sewage.

Once more the proposition to utilize the alleged valuable fertilizing properties of sewage has been made by a high public official, and has held back, at least for a time, the prosecution of important works. The details of this case cannot be made public at this time, even were they of general interest, which is doubtful because they merely repeat the same old story of delusion concerning the value of sewage for enriching cultivated land. This journal has expressed its views on the subject so many times, that it believes in this instance the lack of merit in such a proposition might well be pointed out in general terms by a specialist. It has accordingly requested Mr. George C. Whipple to state in this place his opinion on the subject.

The use of manure as a fertilizer on land is a time-honored custom and one which has much to commend it. To restore to the land the substances abstracted from it by growing crops is at once scientific in theory and practical in result. The value of human excreta for this purpose has been always rated high, although its use has been sometimes restricted because of sentimental prejudices against it or because of real or fancied dangers from its use. In country districts the disposal of privy contents by spreading them upon the land or spading them into the soil is still commonly practiced and its benefit to crops is generally recognized.

When, a few decades ago, the use of privies, cesspools and earth-closets gave way to the water-carriage system and the modern sewer, involving heavy expenses for construction and operation, it was not unnatural that attempts should be made to recover and utilize the nitrogen, phosphates, potash and other ingredients which were not only going to waste, but which were, in many cases, creating nuisances at the place of disposal. The sewerage literature of that time abounds in elaborate calculations as to the financial value of the ingredients of sewage wasted in large cities, and it was "demonstrated" that in some cases the amounts of these losses were equal to the annual charges of construction and operation of the disposal works. Sewage irrigation was heralded as the ultimate solution of the problem of disposal and the sale of sludge as a fertilizer was to pay large dividends on the investment.

In the light of experience and of careful scientific investigation this vision passed away. Speaking generally, the attempt to utilize sewage in this country has signally failed, but there have been enough special cases where local conditions have caused it to partially succeed to keep alive the spark of hope. Therefore, even now, the subject is periodically agitated by some enthusiast who has received a new light or has taken out a new patent.

That sewage contains matters which have a manurial value no one will deny. One of the most recent estimates has placed the amount of solid matter in ordinary city sewage as 230 grams daily per capita of contributing population, or approximately 2.5 tons per million gallons, assuming 100 gallons per capita daily as the volume of the sewage. Of this about 40 per cent. is in suspension and 60 per cent. in solution. Of the dissolved substances about 25 per cent. are organic, and of the suspended matter (sludge) about 40 per cent. The theoretical value of the manurial constituents of sewage may be roughly estimated as somewhere between $2 and $10 per million gallons. Sewage also contains fats and other substances which have some intrinsic value. But the commercial value of useful substances in a raw material can be estimated only after ascertaining the cost of production and after taking into consideration the question of supply and demand. Both of these factors are important in the present instance.

Ordinary city sewage contains more than 99 per cent. of water and to separate the valuable constituents from this water and from the worthless ingredients and to do it in such a way as to create no nuisance has been found thus far to be a practical impossibility. Even if it could be accomplished its economy is questionable. Low grade ores are expensive to work and sewage is decidedly a low grade ore, unprofitable to work and therefore practically worthless.

As an irrigant sewage unquestionably has some value in certain localities and when used in certain amounts. In our western states there no doubt exist conditions where broad irrigation may prove the best means of sewage disposal, but even in these cases there is reason to believe that it is the water of the sewage quite as much as the dissolved solids which is the real stimulant of the crops. Modern theories of the action of fertilizers take into account not only the chemical relations of nitrogen, phosphates, etc., but involve question of physical chemistry, the effect of dissolved substances on capillarity, soil evaporation, etc., and it is quite conceivable that in certain cases pure water might be better adapted to the local soil than sewage.

The chief objection to the use of sewage in our eastern states is the amount and distribution of the rainfall, and especially the autumnal rains which provide an abundant supply of water at a time when little is needed by the crops and when sewage irrigation would be not only superfluous but injurious. Our severe winters also militate against this use. Another important objection is the great extent of land required, its cost, etc. There are decided objections from the sanitary standpoint, moreover, in using domestic sewage on land where vegetables are cultivated which are likely to be served raw, as lettuce, celery, strawberries, etc. Many crops, however, may be cultivated without danger. Some agriculturists consider that the crops obtained from sewage farms where cultivation is forced are inferior in quality to those cultivated otherwise.

In conclusion it may be said that land treatment of sewage carried on primarily for purposes of agriculture is, in the vast majority of cases, doomed to failure. As an auxiliary to other modes of disposal it may be occasionally of value. But the recovery of those substances from sewage which have a theoretical value so as to utilize them in any practical and economical manner is at the present time impossible, and nothing indicating immediate promise of result has, up to the present time, been offered by scientists. GEORGE C. WHIPPLE.

Still Another Report on the New York Water Supply.

Perhaps this journal owes an apology to its readers for again bringing to their attention the subject of the water supply of New York. It has certainly received a large amount of attention in these pages during the last two years; it is possible that so much has been printed that the gravity of the situation is diminished in the appreciation of those most directly concerned. Familiarity with danger breeds a certain contempt for it, which, however, will not be shared by those who have experienced the difficulty of living comfortably where the water supply is very small. Scarcity of water in New York, which now seems imminent, will more directly affect the lives of the people than any other failure in municipal service. If serious, it will mean a great deal more than difficulty in securing an ample amount for domestic purposes, because the first marked sufferers will doubtless be the large power stations. Diminishing the quantity of water supplied to them will cut down the number of cars that run on the streets and elevated lines and the amount of current available for lighting and power purposes. The shortage which would have this effect must be a great one, it is true, and yet the various reports which have been issued by eminent engineers during recent years indicate that such a shortage is not entirely impossible within the next two or three years.

It is because the problem of securing additional water in New York is so very important that attention is drawn to the report made this week to the Mayor by Messrs. Burr, Hering and Freeman. These engineers point out that the rate of consumption of Croton water during the past year has exceeded the amount that all of the present reservoirs in the Croton watershed, together with the large reservoir now being constructed, can supply in a year of small rainfall. No one can predict the year of the next severe drought, they point out; recent years have had more than the average rainfall and years of large and small rainfall follow in cycles, facts that indicate a strong probability that dry years are not far off. It is, of course, possible, by reducing the pressure in house plumbing by partly closing the gates on the street mains, to restrict the consumption, but this involves such inconvenience and increases the fire hazard so much that the Commission does not suggest it save as a last resort. They accordingly believe that two reservoirs should be constructed at once in the Croton watershed, from plans already outlined by the engineer of the Croton Aqueduct Commission, Mr. J. Waldo Smith; no other course seems possible to avoid a serious scarcity of water while the main works for an additional water supply are being carried out. The time it will take to put the latter into service is indefinite, while Mr. Smith believes that he can complete one of the proposed new Croton basins within two years and another within three years. His recent remarkable record in pushing toward completion the works under his charge make it probable that if he is given a free hand he will carry out the promise with a comfortable margin of time to spare.

The main works to be built for an additional supply are discussed at length by Messrs. Burr, Hering and Freeman. They advise, in substance, the construction of a great reservoir on the Esopus watershed west of the Hudson and 58 miles of aqueduct to bring the water to some point in the present Croton watershed, from which it will be taken for a time through the present system of works to the city. The aqueduct line is not to follow the route marked out in the Commission's original report, which was prepared before the legislature prevented the use by New York City of the water of Dutchess County. The plans for an additional supply which were recently prepared by the acting chief engineer of the Department of Water Supply, Gas and Electricity of the city are criticized so severely by Messrs Burr, Hering and Freeman that they may be considered killed.

Although the report of the Commission covers many pages its substance is very elementary, and it is to be hoped that its importance will lead to immediate action. These three experts support all the recommendations made by Mr. Smith for new work in the Croton watershed, not only in order to get an additional supply for the city in the shortest possible time, but also to provide for the eventual filtration of the Croton supply. They further suggest the proper steps to take to secure the construction of works for the large additional supply which will be needed as soon as the yield of the Croton watershed is fully utilized. There is no single project now before the authorities and citizens of New York so important as this; three engineers better qualified to advise the city concerning additional water supply cannot be found, and the time to heed their advice is the present. Further delay is a reckless gamble in which the health and comfort of the people are played against the remote chance that the next few years will continue to bring phenomenal rainfalls.

Proposed Reorganization of the Isthmian Canal Commission.

The work of the Isthmian Canal Commission has been reviewed by the Secretary of War and the President and found to show signs of red tape, in their opinion. The Engineering Record explained at considerable length a fortnight ago its reasons for holding a contrary view, so it is only proper to give in full the criticisms made by the President and Mr. Taft. The latter reported as follows on Jan. 12:

"Without criticizing the Commission, which I think has made as much progress in the necessary preparation for the building of the canal as could be expected in the short time since its appointment, it is not improper for me to say that under the present law the plan for building the canal is inelastic. The evident purpose of the act to require the President to act through the Commission as a body and not to distribute work and responsibility to the members severally, and to fix the salaries of the individual members according to the work which they are to do, renders the instruments with which the President is to build the canal less flexible than they ought to be. If he were able to designate of the Commission certain members to have charge of the executive work, and others to act as consulting engineers in an advisory capacity, and other members of the Commission to discharge other necessary functions, he could construct a machine in the form which experience might indicate to be the most useful."

The criticism made by President Roosevelt, in transmitting the Commission's report to Congress, was as follows: "I concur with the Secretary of War in the view that the present provision of law, by which the work of building the canal has to be done only through a body of seven members, is inelastic and clumsy and I earnestly recommend a change, so that the President, who is charged with the responsibility of building the canal, may exercise greater discretion in the organization of the personnel through whom he is to discharge this duty. Actual experience has convinced me that it will be impossible to obtain the best and most effective service under the limitations prescribed by law. The general plans for the work must be agreed upon with the aid of the best engineers of the country, who should act as an advisory or consulting body. The consulting engineers should not be put on the Commission, which should be used only as an executive instrument for the executive and administrative work. The actual work of executing the general plans agreed upon by the Commission, after receiving the conclusions of the advising engineers, must be done by an engineer in charge, and we now have an excellent engineer. It is, in my judgment, inadvisable, therefore, to restrict the Executive's choice of commissioners to representatives of the Engineer Corps of the army or the navy. The Commission should consist of five, or preferably of three, members, whose respective duties, powers and salaries should be assigned to them by the President, and who should be placed under the member of the Cabinet whom the President desires. Of these men the one appointed as administrator of the canal strip should also serve as Minister to Panama."

It will be seen that these official criticisms are very different from those which have previously been made in the newspapers. The objection raised by the Secretary of War to the present organization is that it does not fix responsibility for certain classes of work on individuals, but puts the whole responsibility on the Commission as a unit. Where the classes of work to be done are so varied, the Secretary evidently believes that better results could be obtained by apportioning each class of work to a separate man or group of men, responsible directly to some federal executive officer. The President's criticism seems to be that the assumption of both technical and administrative duties by a rather large Commission is not so desirable as that method of conducting public works which has its leading exponent in the State of New York. In his experience as Governor of New York, Mr. Roosevelt doubtless became so well satisfied with the plan followed there in planning and executing public works that he wishes to see it carried out on the Panama Canal. In fact, it is not unlikely that this has been his desire from the outset and that the present organization of the Commission has not been satisfactory to him because it falls short of this ideal.

So far as The Engineering Record can learn, the course of the President in this matter is regarded by engineers accustomed to large affairs as hardly just to the members of the Commission. It is true that unfortunate mistakes have been made by the governor of the canal zone and the minister to Panama. Lack of tact has been shown by both officials, but it is important to bear in mind that only one of them is a member of the Commission, and that one has since learned that the canal zone cannot be administered like a frontier army post. So far as the great work of the Commission is concerned, this journal fails to see how it could have accomplished any more than it has in the time since its appointment.

The actual construction of the canal involves certain classes of work which are being pushed rapidly, and other classes which cannot be undertaken until the data for preparing the general outlines of the final plans are collected. Just as fast as it is known that a certain class of work must be done provision is being made for its execution, with only such delays as are incident to the starting of any great piece of construction by men who know that good plans are more easily made than great earthworks. Such men recognize that a little time spent in making such plans is more than saved by the rapid construction which follows their completion. It is for this reason that the engineers of the country believe the Commission has not been given sufficient time as yet to show definitely whether it is wanting in elasticity or any other characteristic, which has not yet been called for by the condition of the enterprise.

Notes and Comments.

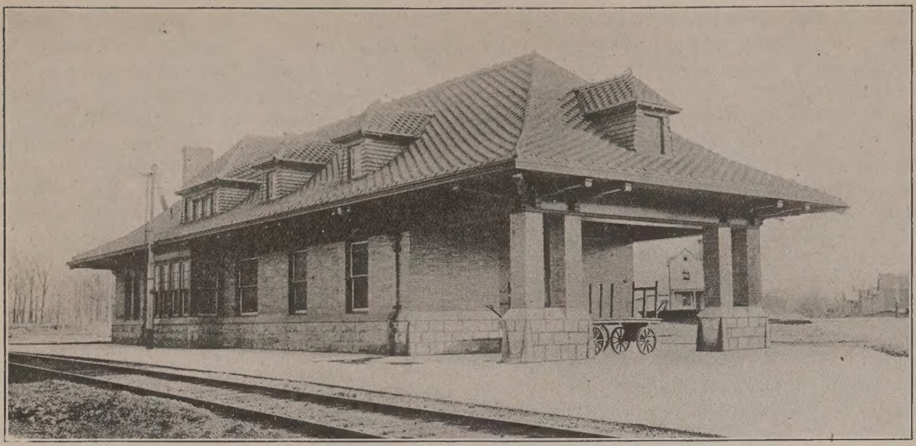
CARBONIC ACID RECORDERS are mentioned favorably so often that it is interesting to record a case where they proved unsatisfactory. Mr. Wm. Cuthill stated at the November meeting of the Institution of Engineers and Shipbuilders in Scotland, that obtained such an instrument and applied it to a range of boilers which the smoke inspectors frequently swore did not get a sufficient supply of air, the recorder indicated the CO_2 at about 5 per cent., showing a large excess of air. Dampers were lowered so as to reduce the draught of air at the furnaces, with the result that the CO_2 was raised to about 10 per cent., where at least it should be for economy, and the smoke made much more dense. While engaged with these CO_2 recorder experiments, the smoke inspectors came round one morning between six and seven o'clock, and the final result of the use of the recorder was a prosecution, conviction and fine. It had not been in use since.

A METHOD OF DETERMINING THE MOISTURE IN STEAM at atmospheric pressure was described by Prof. D. S. Jacobus, of Stevens Institute, in a recent paper read before the American Association for the Advancement of Science. A known weight of superheated steam at a given temperature was mingled with a known weight of saturated steam at atmospheric pressure. The steam, after the mixture, was still superheated and its temperature was measured. Careful measurements were made to determine the radiation of the apparatus. From data thus obtained the amount of moisture in the saturated steam was determined. This method, he explained, is similar to that employed by Mr. Geo. H. Barrus in one of the older forms of his calorimeters. The particular problem to be investigated was how much moisture would be contained in steam at atmospheric pressure after it had passed through two separators of a certain form. The tests showed that the steam at atmospheric pressure leaving the separators contained about one-tenth of one per cent. of moisture, a result which was within the probable error of the instrument, for which reason it was fair to conclude that the steam was dry.

THE SLUDGE IN THE SEPTIC TANKS of the sewage disposal system of Barrhead, England, has never been cleaned out in the six years they have been in operation, according to a paper read by Mr. William Shanks before the Sanitary Institute at Glasgow, yet the works have not lost their efficiency during that time. The disposal plant consists of two grit chambers, four septic tanks and eight filters, the total filtering area being about 2,540 sq. yd. They were designed to deal with the domestic sewage of 10,000 people and a small amount of roof drainage, with a total maximum flow of 400,000 imp. gal. per day. Surface water and manufacturing wastes are discharged in a stream, and the road detritus is not permitted to enter the tanks. At the end of the tanks next to the filters there is a scum on top about 1 in. thick, while at the other end no scum is present. The sludge at the bottom of the tanks toward the outlet end is about 3 ft. deep; at the inlet end there is none at all. The surface of the filters is occasionally broken up as the scum gathers on top of them. The total cost of the plant was about $32,860, while the total operating expense, including an attendant, repairs, etc., are about $390 a year.

THE NEW JERSEY SEWERAGE COMMISSION received a deserved compliment in the message of Governor Murphy to the Legislature this year. It reads as follows: "The report of the State Sewerage Commission shows active work during the year and commendable effort to aid municipalities in sewerage enterprise and safeguard the streams of the State from dangerous pollution. The suggestions and recommendations of the Commission are in line with sound public policy and are deserving of favorable legislative consideration. I would suggest that the State Board of Health should refer subjects which the State Sewerage Commission has power to deal with, to that body for action." The problems presented to the Commission are rapidly becoming very important, not only on account of the great increase in the population of certain parts of the State but also on account of the importance of keeping water courses free from pollution which will injure the reputation of the neighborhoods as summer resorts. Few people recognize the importance to New York and Philadelphia of the many attractive summer resorts of New Jersey, and the Commission's work in keeping these places free from the offense which attends improper methods of sewage disposal has been of benefit in this way to a considerably larger number of people than the Jersey citizens themselves.

THE SIZE OF CULVERTS in railway embankments has been the subject of so much discussion that there is little to be said that is new. It is important to bear in mind, however, that there is a legal as well as an engineering side to the question. The usually accepted engineering view was well expressed by the late A. M. Wellington in his "Economic Theory of Railway Location," as follows: "In a certain narrow and limited sense we may say that the natural end of a culvert, and even of many bridges, is to perish in some excessive flood. . . . When structures have been skilfully laid out to stand the ordinary contingencies of 20 or 30 years, it is about all that is either practicable or justifiable." This view often leads to the construction of culverts so small that adjoining land is flooded, and the legal aspect of culvert design thus comes to the front quite often. For example, in Uhl v. Ohio River R. R. Co., 49 S. E. Rep. 378, the Supreme Court of Appeals of West Virginia rendered the following decision last month: "Failure of a railroad company to make culverts in an embankment constructed by it for its roadbed, on lands subject to overflow, of sufficient size to permit the water behind the embankment to rise and fall as fast as the stream does, is negligent and unskilful construction, making the company liable in damages for resulting injury." Attention is drawn particularly to this decision because it contains a discussion of opinions on the subject by the courts of numerous States. The importance of the legal aspect of the culvert construction is well shown by the many suits involving it which have recently been brought in different parts of the country.



Station at Muncie, Ind.

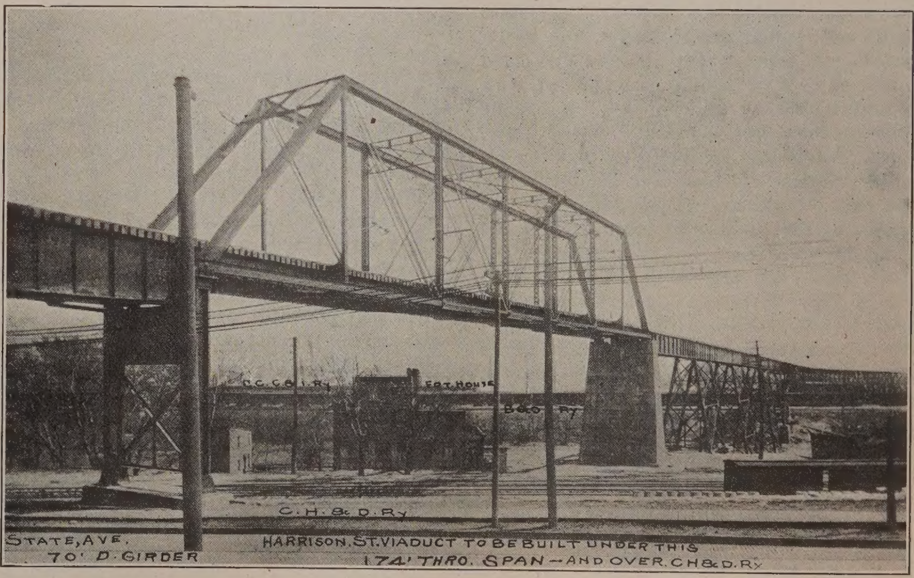
THE BUILDING OF THE CHICAGO, CINCINNATI & LOUISVILLE AND CINCINNATI, RICHMOND & MUNCIE RAILROADS.

By H. L. Weber, Consulting Engineer, City Engineer, Richmond, Ind., and Fred R. Charles, Civil Engineer, Richmond, Ind.

Some six years ago, the City of Richmond, Ind., which has the reputation of being the prettiest city and the wealthiest, per capita, in the Middle West and is a noted manufacturing center, in order to procure better accommodations and freight rates, and realizing that "competition is the life of trade," decided to secure the advantage of another railroad. The City Council and the citizens, through the engineering department, made plans and surveys on various routes, and finally decided to promote a line from Cincinnati to Chicago, passing through Richmond and other cities in the heart of the Indiana gas belt. A group of Boston and Chicago capitalists was interested in the project, and on May 1, 1900, the first stake was driven on the work of location. In about three and one-half years trains were running from Cincinnati to Griffith, a suburb of Chicago, a distance of 254 miles, breaking all records in railroad building in this part of the country and causing old, conservative lines to stare with astonishment. No railroad in the country has caused more comment or been the subject of more newspaper speculation than this. The engineering and constructional features are worthy of note: everything is the best that can be bought; heavy rails, steel bridges, concrete masonry, handsome station buildings, all evidences of a first-class road.

A trip down the line shows much of interest both to the professional and the lovers of the picturesque. The Tippecanoe and Eel rivers, the two prettiest streams in Indiana, are crossed by steel girders. At Peru, Ind., we run "on the banks of the Wabash" for several miles, using the tow-path of the old canal, once a prominent factor in this region, but its usefulness gone long ago. At Peru are located the division offices and the shops of the company. These latter are still in a growing stage, and when completed will be sufficient for all requirements. At Converse we meet the Pennsylvania R. R., and after crossing under it, run alongside in a spirit of sociability, for 10 miles to Marion, the heart of Indiana oil territory. Through a large portion of this city, over the principal streets, and the Clover Leaf and Big Four railroads, the track is elevated. The streets and railroads are crossed on steel girders; the remainder, about 2,200 ft., is wooden trestle, to be filled in later.

Passing Jonesboro and its companion Gas City, on the banks of the Mississinewa River, we reach one of the "sink holes" which, with several others of a similar nature, taxed severely the resources of the engineering department. These holes while presenting on the surface the appearance of the ordinary ground around, when any bank or bridge is placed thereon, give way and swallow up vast quantities of material in a seemingly bottomless pit. Trainload after trainload of earth was dumped in without any apparent effect. This particular sink hole was finally crossed by making a large timber mattress, laying logs in the form of a grillage, and wiring the brush in and around them. Twenty-two acres of heavy timber was put in this hole, only a few hundred feet across. Another one of these troublesome holes only gave trouble after trains had been running over it for a year without any apparent effect. A settlement, gradual at first, but increasing, swallowed a bridge and a section of track beyond recovery. After putting an immense amount of earth and rock into the abyss, a foundation was finally secured by dumping many trainloads of sand enclosed in burlap sacks. In one hole piling was driven for 96 ft. without finding bottom.


C.C.C.& I.Ry
FRT. HOUSE
B.&O. Ry
C.H.&D.Ry
STATE, AVE.
70' D. GIRDER
HARRISON.ST.VIADUCT TO BE BUILT UNDER THIS
174' THRO. SPAN—AND OVER. C.H.&D.Ry

Bridge on Entrance to Cincinnati.

At Muncie, Ind., the White River is crossed by a three-span girder bridge. As illustrating the rapidity and thoroughness of construction, we may mention that work was begun on the abutments of this bridge on May 28, and on July 11 trains passed over, making only six weeks consumed in erecting two abutments, two river piers, constructing superstructure and laying track. Leaving Muncie the road skirts the banks of White River, crossing the Lake Erie & Western and Big Four railroads under grade, which causes the grade of this road to be 5 ft. under high water of the river, and necessitates protection against overflow, which is obtained by specially designed and ingenious drainage system.

At Richmond, for several miles the line runs along the picturesque gorge of the Whitewater River, crossing two branches of the river on steel bridges, one of which is among the longest in the State. (For description of this bridge see The Engineering Record, Vol. 45, page 462.) At Richmond the Whitewater branch of the road runs to the Starr Piano Works and various other industries, which are located in the gorge of the river over 80 ft. below the main track and about 100 ft. distant horizontally. To reach the bottom of the gorge, a switch-back was constructed with maximum grade of 4 per cent., which accomplishes the result desired, although constructed at great expense. An ordinary switch engine handles seven cars on this grade without trouble.

South of Richmond the line traverses the Elkhorn and Short Creek hills, a region which for forty years has baffled the railroad builder, although survey after survey has been made. This country requires the use of a one per cent. grade, and heavy curvature for about six miles. Reaching the table land, a tangent 18 miles long ensues. Dropping from the plateau to the Miami River and through the hills that surround Cincinnati also took very heavy work. At Okeana, Ohio, the Dry Fork is crossed on a wooden trestle 840 ft. long and 63 ft. above the bed of the stream. One of the illustrations shows this trestle and the Hurley track machine at work over it.

This machine was one of the interesting features of construction. It was made at Scranton, Pa., and was the only one of its kind in existence. The inventor, Mr. Hurley, a practical civil engineer and railroad builder, spent ten years in perfecting the machine and thousands of dollars on experiments and models before success crowned his efforts. He accompanied it on the work. This tracklayer differs

Table of Bridges in Cincinnati, from Eighth Street North.

No.	Length ft.	Pile bents.	Deck Single.	Deck D'ble.	Deck Three.	Alignment.	Grade	Panels
1.	882	8	56	..	..	Tang.	0.0	63†
2.	714	20	32	..	..	"	0.30	51†
3.	1.736	95	31	..	..	"	0.10	125†
4.	2,226	4	57	84	14	" & 8° C.	1.62	23‡
4.	740§	..	..	..	..	..	....	..
4.	266	13	5	..	..	Tang.	1.22	19†
4.	96[1]	..	..	..	..	..	....	..

(The above seven bridges are practically one bridge 6,660 ft. long, as the only breaks are at Liberty and Gest Sts. and the C., N. O. & T. P. R. R., a total distance of less than 300 ft.)

No.	Length ft.	Pile bents.	Deck Single.	Deck D'ble.	Deck Three.	Alignment.	Grade	Panels
5.	1,185	19	32	17	..	Tang.	1.90	3[2]
6.	546	16	16	5	..	"	1.90	39†
6.	545[3]	..	..	..	..	..	....	..
6.	238	6	11	2	..	T. & 5°	1.90	17†
7.	98	4	3	..	..	4°.	1.90	7†
8.	392	6	9	6	8	5°.	1.90	28†
9.	308	5	3	6	9	3°.	1.90	22†
10.	280	6	11	4	..	5°.	1.90	20†
11.	280	7	15	..	..	Tang.	1.90	20†
12.	168	4	9	..	..	Tang.	1.90	12†
13.	112	..	9	..	..	5°.	1.90	8†
14.	84	..	7	..	..	5°.	1.90	6†

†No. of 14-ft. panels.

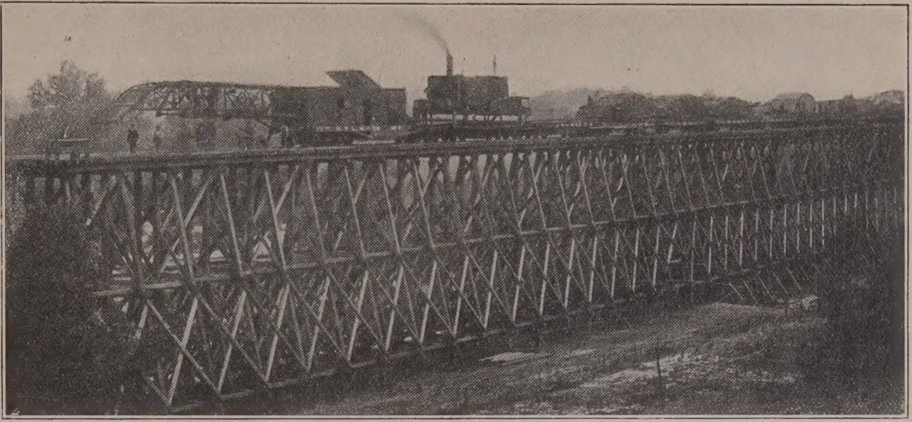
‡23 special and 16 pony bents.

§740 ft. of steel; one 174-ft. through truss; one 100-ft., one 85-ft., two 70-ft., one 55-ft., one 36-ft. deck girders, and five 30-ft. towers.

[1] 96-ft. steel; one 76-ft., one 20-ft. through girder, steel I-beam floor.

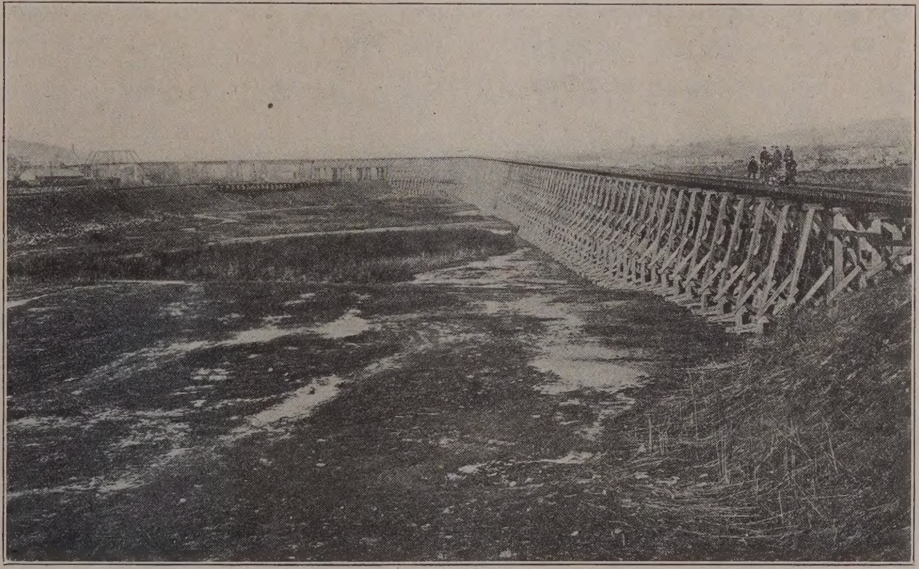
[2] Three 85-ft. deck girders.

[3] 545 ft. steel; one 85-ft., four 70-ft. deck girders, six 30-ft. steel towers.



Track-Laying Machine on Dry Fork Valley R. R.

in many points from other machines of the kind. The ties are put in position by an endless chain carrier, while a crane suspended upon a steel truss places the rails in advance of the construction train. The machine furnishes its own motive power, and consequently requires no locomotive. The conveying machinery can be operated at the same rate of speed at which the train is moved, or its speed can be doubled. Rails of any weight can be handled. When conditions were favorable, three miles of track in a day of ten hours were laid without difficulty. On some stretches the construction train moved at the rate of 1,800 ft. an hour. The average rate was two and a half miles per day. A force of forty competent men was all that was required to operate the machine to its fullest capacity. The weight of the machine was about fifty tons.



One of the Trestles in Cincinnati.

Getting into the heart of Cincinnati was accomplished through work so gigantic and unexpected that it was called by conservative railroad men "Bradford's Folly," not in a spirit of derogation but in sheer wonderment at the boldness and audacity of the scheme. For several miles within the city limits the road is elevated. At Quebec Ave. the street cars are 98 ft. beneath. This viaduct is a 545-ft. steel and 770-ft. wooden trestle. The Mill Creek viaduct, "Bridge No. 4," crosses two streets, the Cincinnati, Hamilton & Dayton R. R., with five tracks, the Baltimore & Ohio Southwestern R. R. with five tracks, the Big Four freight yards with six tracks, Mill Creek and a long stretch of Mill Creek Bottoms. Looking north from the terminus at Eighth St. this bridge presents a grand sight. It rises apparently out of the valley to a height of 80 ft. The grade is 1.63 per cent.; part is tangent and part an 8 deg. curve. The greater part is three decks high; 836 ft. is steel and the remainder is wooden trestle. The valley is 35 ft. below the intersecting streets, and this trestle will be filled to that height, in fact a portion has already been filled.

An interesting feature of this bridge is a concrete pier supporting one end of the 174-ft. truss and one end of 85-ft. girder. This pier is built of crushed limestone, Alpha and Atlas cement, and reinforced to some extent with iron rods and galvanized wire. This pier is 56 ft. high, but after erection the surrounding ground was filled in, so the present height is 42 ft. above the ground. The footing is 36x20 ft., and these dimensions are stepped down to 26x10 ft. at the 40-ft. point; the batter is ¾ in. per foot to the top which is 21x5 ft. The form was built of 6x8-in. uprights and 3-in. sheeting, dressed. It was tied together with ¾-in. rods extending from side to side and end to end, which were cut off flush with the outside of wall when the form was taken down. Concrete was made moderately wet, and finish secured by pressing coarse material back from the form with a flat spade, and ramming to force the fine cement to the surface. This method of finishing, which was used on all concrete work, gave a very smooth finish when carefully done, and proved very satisfactory, both from the standpoint of appearance and economy.

Connecting tracks to the Cincinnati, New Orleans & Texas Pacific Ry. and the company's freight house are built on deck trestles 40 ft. in height and on 12 deg. curves.

The steel bridges were built under Cooper's 1896 and 1901 specifications, with Class E 40 loading. The Wabash Bridge & Iron Co., Wabash, Ind., built all the structures except those at Quebec Ave. and Mill Creek, Cincinnati, which were furnished by Phœnix Bridge Co. and erected by the company. An interesting feature of this erection was the lifting of the 100-ft. girders over the Baltimore & Ohio Southwestern R. R. This lifting was done with a gin pole from a flat car under the site, and when all was ready, a girder was lifted and set in place in six minutes. Mr. A. L. Kuehn was engineer in charge of this erection and Mr. Wilson Hinkle was foreman.

From Eighth St., Cincinnati, north for a distance of 20,700 ft. there are fourteen bridges, aggregating 10,940 ft. in length and from 14 to 100 ft. in height. Of this length over 5,000 ft. will be filled in when the permanent way is completed, as concrete culverts will provide ample openings. The accompanying table will give an idea of the magnitude of this work.

With the exception of the bridge over Whitewater River, above mentioned, and the one at the crossing of the Baltimore & Ohio Southwestern R. R., raised by gin pole, all girders were placed with a steel traveler designed by Mr. C. E. Howe, chief engineer of the Wabash Bridge Works. This traveler, shown in the accompanying photograph, was mounted on a flat car, the track laid to the bridge and girders landed in a few days. This traveler handled girders up to 85 ft. in length very expeditiously. After the traveler was set and anchored, the girders were swung out and landed in from nine to eleven minutes.

Mr. H. L. Weber, at present city engineer of Richmond, Ind., and the original promoter of the railroad project, acted as consulting and designing engineer; Mr. Fred R. Charles was engineer in charge of masonry and other construction work; Messrs. J. M. Harper, F. J. Hunt, R. M. Henley, T. H. Robbins, J. K. Sroufe, W. H. Stice and C. L. Persons were division engineers. The chief engineer was Mr. H. L. Jackson, of Cincinnati, Ohio.

A DIESEL OIL ENGINE has been operating some time in the Rothesay, England, street railway plant, where, according to the "Tramway & Railway World," the average oil consumption has been 0.886 lb. per kilowatt-hour.

Waterproofing Concrete Structures.

A paper presented to the Cement Users' Association, by W. H. Finley, Principal Assistant Engineer, Chicago & North Western Ry.

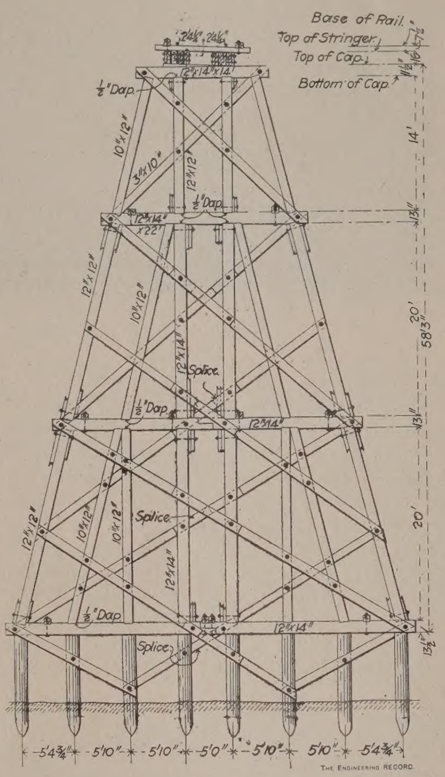
Ever since concrete has entered so largely into the field of construction as a substitute for stone masonry there has been more or less discussion as to its permeability, and various expedients have been resorted to to prevent the seepage of water through the material. This refers more particulraly to the large masses of concrete built for engineering structures. I am aware that there has been more or less success in making concrete impervious to the action of water by various means, but do not think that any of them have given such satisfaction as to become generally used.

It is a question whether the addition of alum, soap and other extraneous material does not affect the lasting qualities of the concrete. If the announcement of the Star-Stettin Portland Cement Works that they are now manufacturing, according to a process invented in Germany, a waterproof cement which will become impervious to water, will resist the action of frost, heat, hot water, sea water and diluted acids, is borne out, the question of waterproofing concrete is settled for all time. However, concrete, as usually built in many engineering structures, is not impermeable to the action of water, and some method of waterproofing the same, I think, is vitally necessary. That this is appreciated by engineers is clearly evidenced by the amount of waterproofing that is now being done on concrete arches, abutments, retaining walls, etc. I have recommended for years the necessity of waterproofing both stone masonry and concrete structures where there was any danger of seepage of water, and believe that such a precaution will extend the life of the structure.

A recent examination of concrete abutments, retaining walls, etc., built in Chicago some years ago, disclosed the fact that water was seeping through the mass in several places, particularly along the parting planes where the work was not carried on continuously. This condition is frequently observed in concrete construction, and I think could be entirely prevented if the back of the structure was thoroughly waterproofed with asphalt.

Some years ago I had occasion to repair some masonry arches built in 1862 that were rapidly disintegrating owing to the infiltration of water. These arches were uncovered, the damaged stone replaced, and the extrados of the arch was plastered with cement concrete and then thoroughly waterproofed with asphalt. Time has demonstrated that this work was very successful. I have since uncovered a number of arches that were leaking and found that the concrete backing did not prevent the entrance of water. These were cleaned off and waterproofed with asphalt in each case. It is now the practice on a number of railroads to thoroughly waterproof all arches, abutments, retaining walls, etc. The method generally employed is to use as a first coat asphalt cut with naphtha, to be applied as a paint to the concrete after the same is perfectly dry, and then cover the surface with an asphaltic mastic composed of one part of asphalt to four of sand; this to be smoothed off with hot smoothing irons and thoroughly tamped and pressed into place. If the filling over the arch is ordinary gravel or dirt no other work will be necessary, but if it is filled with broken stone or stone chips it is better to cover the surface of the asphalt with washed roofing gravel so that the broken stone will not cut or damage the asphalt surface.

There are various other methods employed in waterproofing concrete surfaces with asphalt, such as the use of burlap or other fabric imbedded in the asphalt coating. It is very difficult to make hot asphalt adhere to a concrete surface, however dry the same may be, unless it is heated by artificial means. Hot asphalt laid on ordinary dry concrete will not adhere and can be rolled up like a blanket after it has cooled. I have had some sucess in applying hot asphalt direct to concrete surfaces after the same had been dried and heated with hot sand, but much prefer the use of the asphalt cut with naphtha applied as painting or swabing coat. The cost of this work with present prices of first-class asphalt will range from 10 to 20 cents per square foot, depending upon local conditions. It does not require any special expert knowledge for its application. After a brief coaching the forces as usually employed can produce a satisfactory job.



Standard Trestle Bent.

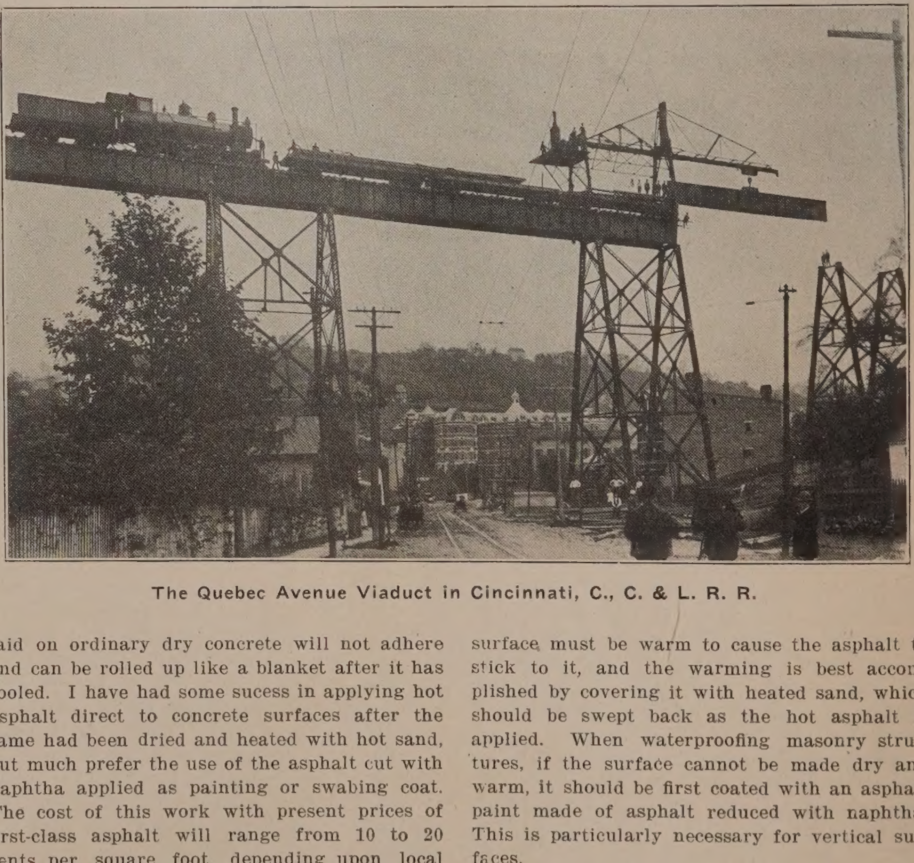
It might be well at this time to say something about the quality of the asphalt to be used for waterproofing purposes. In the past few years there has been a large development of asphalt for this purpose and it is now possible to get, at a reasonable price, a pure asphalt that will not flow under a temperature of 212°, and not become brittle, when spread thin on glass, at 15° below zero. Also it will resist the action of acids and alkalies.

The following specification is one that I have used with good results in waterproofing works:

"Asphalt shall be used which is of the best grade, free from coal tar or any of its products, and which will not volatilize more than one-half of 1 per cent. under a temperature of 300° Fahr. for 10 hours. It must not be affected by a 20 per cent. solution of ammonia, a 35 per cent. solution of hydrochloric acid, a 25 per cent. solution of sulphuric acid, nor by a saturated solution of sodium chloride.

"For metallic structures exposed to the direct rays of the sun, the asphalt should not flow under 212° Fahr. and should not become brittle at 15° Fahr. when spread thin on glass. For structures underground, such as masonry arches, abutments, retaining walls, foundation walls of buildings, subways, etc., a flow point of 185° Fahr. and a brittle point of 0° Fahr. will be required. The asphalt covering must not preceptibly indent, when at a temperature of 130° Fahr. under a load at the rate of 15 lb. per square inch, and it must remain ductile at a temperature of 15° Fahr. on metal structures, and at 0° Fahr. on masonry structures under ground.

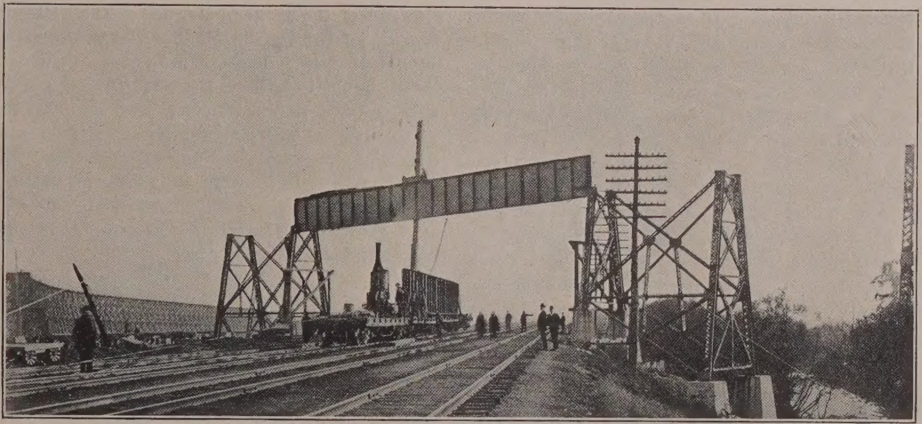
"Before applying asphalt to a metal surface, it is imperative that the metal be cleaned of all rust, loose scale and dirt, and if previously coated with oil, this must be burned off with benzine or by other suitable means. The metal surface must be warm to cause the asphalt to stick to it, and the warming is best accomplished by covering it with heated sand, which should be swept back as the hot asphalt is applied. When waterproofing masonry structures, if the surface cannot be made dry and warm, it should be first coated with an asphalt paint made of asphalt reduced with naphtha. This is particularly necessary for vertical surfaces.



The Quebec Avenue Viaduct in Cincinnati, C., C. & L. R. R.

"The asphalt should be heated in a suitable kettle to a temperature not exceeding 450° Fahr. If this is exceeded it may result in "pitching" the asphalt. Before the "pitching" point is reached, the vapor from the kettle is of a bluish tinge which changes to a yellowish tinge after the danger point is passed. If this occurs the material should be tempered by the addition of fresh asphalt. The asphalt has been cooked sufficiently when a piece of wood can be put in and withdrawn without the asphalt clinging to it.

"The first coat should consist of a thin layer poured from buckets on the prepared surface and thoroughly mopped over. The second coat should consist of a mixture of clean sand or screenings, free from earthy admixtures, previously heated and dried, and asphalt, in the proportion of 1 of asphalt to 3 or 4 of sand or screenings by volume; this is to be thoroughly mixed in the kettle and then spread out on the surface with warm smoothing irons, such as are used in laying asphalt streets. The finishing coat should consist of pure hot asphalt spread thinly and evenly over the entire surface, and then sprinkled with washed roofing gravel, torpedo sand, or stone screenings, to harden the top. The thickness of the coating will depend on the character of the work and may vary from ¾ to 2 in. in thickness.



Erecting Girder Bridge with Gin Pole, C., C. & L. R. R.

"Where a quantity of asphaltic concrete is required, such as in trough floors on bridges, a concrete should be made in the proportion of 1 part asphalt, 2 parts sand and 3 parts limestone screenings, thoroughly mixed and rammed into place with tamping irons on the first coat of pure asphalt with which the metal was originally covered. At all drainage holes large sized stone should be carefully placed by hand to insure perfect drainage."

It may not be out of place in discussing the question of waterproofing, to call attention to the necessity for provisions for drainage in all concrete and masonry structures. This has not been given as much attention as it should receive. Whether waterproofing material is applied or not, the question of thoroughly draining the structure is of the greatest importance.

In ordinary building construction sufficient attention has not been given by architects and builders to the proper waterproofing of their foundation walls. I have observed recently in this vicinity, a number of buildings in process of construction where the excavation for the cellar and lower foundations were made in a clayey material and concrete foundation walls put in without making any attempt to apply a waterproofing or damp-proof coating to the wall or provide suitable drainage to carry off the ground water.

In this particular we are falling away behind even the early Roman architects and builders. In all the examples of their work it is evident they gave the greatest consideration in their construction to proper methods for keeping their foundation walls dry, and we cannot do better to-day in such matters than follow the advice of the great architect, Vitruvius, who, writing about twenty-five years B. C., described methods of waterproofing and ventilating foundation walls that compare favorably with the best methods used to-day, excepting that we may have better materials for waterproofing than were known at that time.

Asphalt, I believe, makes the best damp-proof or waterproofing material that can be used in foundation walls and for all structures where such provision is necessary. It has been used from the earliest times for the purpose of protecting material from air and water and we have examples of it in our museums where the mummy cases were sealed with this material more than 3,000 years ago.

I think the various makes of hollow concrete block offer a good field for the application of waterproofing. It is in line with the ideas of the early Romans in building hollow walls to take care of the question of dampness. I am of the opinion that these blocks laid up in asphalt, and the surface next to the ground thoroughly coated with the same material make an ideal damp-proof wall.

I have found that the waterproofing qualities of asphalt, even when used under water pressure, is all that could be desired. When repairing a stone reservoir recently the following method was used: A single course of brick was laid up in front of the wall, this brick being heated until the moisture was driven out, and then soaked in hot asphalt and laid in place, the space between the brick and the stone being filled with an asphaltic concrete of limestone, screenings and asphalt in the proportion of about 1 to 4. These brick were anchored into the stone wall at intervals and the work has given very good satisfaction.

Timber Trestle Construction, C., C. & L. R. R.

An Iron-Wire Rheostat for Dynamo Testing.

An iron-wire rheostat suitable for testing purposes with dynamos was described briefly in a note in The Engineering Record of Aug. 20 of last year. The apparatus was used by a Mr. Weber, of Nancy, France, and was remarkable from the fact that the current density in the wire used was 25,300 amperes per square inch and that the actual voltage drop was about twice the theoretical. The subject is now again brought into prominence through a letter written to the technical press of England by Messrs. Henry Lea & Son, of Birmingham.

Admiring the compactness and cleanliness of the arrangement, but doubting the recorded drop, they had a small coil fitted into a box about 30 in. long. The wire was of steel, 0.0085 in. diameter and 25 ft. long, wound into a coil ⅜ in. diameter and 1/10 in. pitch. It was connected to a 220-volt service and theoretically should have passed 10 amperes, but only 5 amperes would pass, and about half the length of wire had to be removed before 10 amperes would flow. They were not able to explain how this result came about. The current density was 175,000 amperes per square inch, but the wire carried it perfectly well. Clean tap water was used in the box to keep the wire cool. As the water was not intended to act as a conductor no acid or salt was necessary. Any addition of that kind would, they thought, lead to corrosion of the wire.

Subsequently they used two coils of this kind in parallel for testing a 75-kw. plant at 220 volts. The wire was of iron 0.0625 in. diameter. The box was 7 ft. long and 12x6 in. inside. There were four coils in the box, intended for testing two 75-kw. sets in parallel, but only one set was then tested and only two coils were used. A small stream of tap water was passed through the box, but on this occasion its volume was not measured. The temperature of the water rose only a very few degrees. The current density was 56,000 amperes.

The chief value of the device, they believe, is in testing generating plants after they have been erected at the purchaser's works.

The Bethlehem Junction Bridge.

A Pratt-truss bridge of 84½-ft. span c.c. and 60 deg. skew, with suspended floorbeams and Phœnix-column compression members, has just been replaced by a through, single-track, plate-girder bridge with a clear span of 80 ft. carrying the Bethlehem spur of the Lehigh and Susquehanna divisions of the Central Railroad of New Jersey over the Lehigh Canal at Bethlehem Junction. The new bridge has two plate-girders, 9 ft. 6½ in. deep back to back of angles, which are 18 ft. 10 in. apart on centers and are skewed 10 ft. 10 in. They are proportioned for the standard loading of two 375,000-lb. locomotives, each having four pairs of drivers 5 ft. apart with 55,000 lb. on each axle. The locomotives are followed by a live load of 5,000 lb. per linear foot, and the bridge is assumed to have a total dead load of 2,800 lb. per linear foot. The track is laid across the bridge on a 10 deg. curve and an average speed of 20 miles an hour is assumed for the trains. Owing to the limited clearance under the base of rail, the floorbeams are only 27¼ in. deep and 9 ft. 2½ in. apart. The maximum end shear and bending moment in the girders are 265,500 lb. and 4,891,200 ft.-lb., respectively; in the floorbeams 68,000 lb. and 383,000 ft-lb., and in the stringers 56,000 lb. and 97,000 ft.-lb.

The bridge was built of open hearth medium under Cooper's 1901 specifications, and some of the most essential features were briefly noted on the principal drawings as follows:

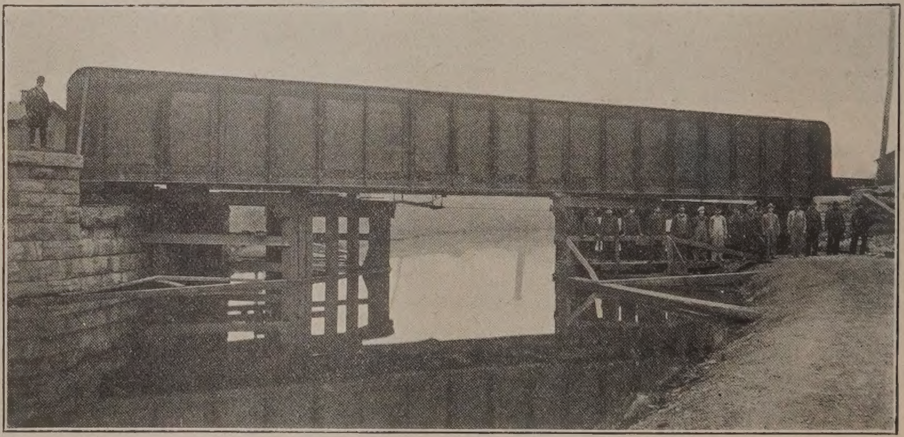
All holes through bottom flange angles, bottom cover and side plates and web at bottom to be punched 13/16 in. in diameter and reamed to 15/16 in. in diameter. All holes for field riveting excepting those through outstanding legs of bottom flanges to be reamed to an iron template or reamed true while the parts are temporarily connected together in the shop. All stiffening angles, web splice-plates and reinforcing plates at ends of girders to be milled to bear at both ends. All flange angles, flange side-plates, and top cover-plates to be milled to bear at both ends. All bottom cover-plates and bottom flange splice-plates and angles to be faced at both ends. All holes for bottom flange splice plates and angles to be reamed.

The details of the main girders correspond to those shown by the elevations of the end and intermediate panels. The web is ½ in. thick throughout and is made with end sections about 12½ and 20 ft. long and intermediate sections 18 ft. 4¾ in. long. They are spliced with double cover-plates having their ends milled to bearing on the flange side-plates, and each section is stiffened by three intermediate pairs of 6x3½-in. vertical angles crimped over the flange angles, fillered over the webs between the side-plates and milled to bearing at both ends. At splices the stiffener-angles are not crimped. Each flange cover-plate is made in a single piece, but the flange-angles are each made in two pieces with their splices at opposite ends of the girder on opposite sides of the web. At each splice the joint is made for the flange-angle on one side of the web and for the side-plate on the opposite side of the web, both of them being covered by the same pair of cover-angles and cover-plates. The ends of the plates and angles are milled at the joints and the ends of the lower chord cover-plates are faced.

The upper corners of the girders are rounded to a radius of 2 ft. and the top flange-angles are cut off about 3 ft. from the end of the girder tangent with the ends of the short vertical angles of the same size which are curved to meet them. The ends of the angles and of the cover-plate at this point are milled. If the end vertical angles and the lower-chord angles extended to intersect, the former would have to be crimped to clear the latter. In order to avoid this, both angles are cut as shown in the detail, and their ends are faced to bearing with a cover-plate riveted over the miter joint in the angles.

The girders take bearing on 4¾-in. pins 84 ft. 6 in. apart on centers. The pins engage shoes riveted to the lower flanges of the girders and pedestals with fixed bearings at one end and expansion bearings at the opposite end. Both shoes and pedestals have three webs in which the bearings are practically half-holes, although the outer plates of each have full-holes to lock them together. The webs in the pedestals are connected by vertical transverse diaphragms and the base-plates are extended to distribute the load over a larger area of the masonry. The fixed pedestals are seated on rolled-steel plates 1 3/16 in. thick and the roller pedestals are seated on nests of 4-in. rollers with bed-plates 1⅝ in. thick planed down to 1¼ in. thick for the bearing, thus leaving outside ribs ⅜ in. high to serve as guides for the rollers which are not grooved.

The floorbeam webs are made in three lengths, the two end sections projecting beyond the top flanges to make gusset connections reaching to the top flanges of the main girders and connected to them by twenty-nine ⅞-in. field rivets to the vertical web-stiffener angles.



Bethlehem Junction Bridge and Falsework.

The end floorbeam connections are so near the adjacent 6x6-in. web-stiffener angles that the latter are omitted until after the floorbeams are in place, so as to allow a better opportunity for driving the field rivets. They are then field-riveted to the girders and on this account the number of rivets in them is in excess of those for the other stiffeners.

The stringers are made with an 18x⅝-in. web-plate and pairs of 6x6x17.2-lb. flange-angles, and are connected to the floorbeams by twenty ⅞-in. rivets at each end. The end stringers are all made of the same length and are supported on special seats offset from the skew of the abutments so that all ties rest wholly on the stringers or wholly on the shore, the tops of the abutments being rebuilt to suit. The lateral system consists of pairs of 3½x3½-in. angles riveted to connection-plates engaging the lower flanges of the girders and of the floorbeams and riveted through fillers to the bottom flanges of the stringers at intersections. At these points the diagonals are cut to clear the stringers and are spliced across them by ½-in. horizontal plates 12 in. wide. The connection plates to the girders are slotted to clear the outstanding flanges of the web-stiffener angles. The shore ends of the end stringers are braced to one girder by an I-shape horizontal strut made with two pairs of angles back to back latticed and field riveted to the web-stiffener angles of the girder. Each main girder weighed 65,000 lb. and was riveted complete in the shop and both were shipped whole on three cars. The total weight of the bridge is 225,000 lb.

For the removal of the old structure and the erection of the new one, two bents of framed falsework were erected under the panel points at each end of the old bridge. Those at the ends of the span were made with four vertical posts and 13-ft. caps on which the lower flanges of the old floorbeams were blocked up under the stringers. The two bents nearest the center of the span each had six vertical 12x12-in. posts and a 16-ft. cap on which the floorbeam was blocked up under the stringers and under one end. On this end of the floorbeam was seated a temporary second-hand plate-girder 27 in. deep and 29 ft. 3 in. long, the opposite end of the girder being seated similarly on the top of the second old floorbeam which was supported on a special falsework bent with three vertical posts and a 6-ft. cap set parallel with the face of the abutment and with the axis of the river. The two temporary plate-girders thus supported adjacent to the two center panels of lower chord of the old truss provided an unobstructed waterway 20 ft. wide at right angles to the direction of the canal to provide for navigation.

Each of the old floorbeams which was supported, together with the temporary girder, on the special three-post oblique bent of falsework was carried at the other end by four 1¾-in. vertical screw-rods 4 ft. long with nuts at both ends. The nuts at the lower end took bearing on four transverse 8x24-in. steel plates 2½ in. thick, on which the lower flanges of the floorbeams rested. The two bolts on each side of the florbeam passed through the lower flange of the temporary girder and through the flanges of horizontal shelf-angles riveted to both sides of its web and reinforced by pairs of vertical angles fitted under the horizontal flange. The old floor being thus entirely supported, it was disconnected from the trusses and they were removed.

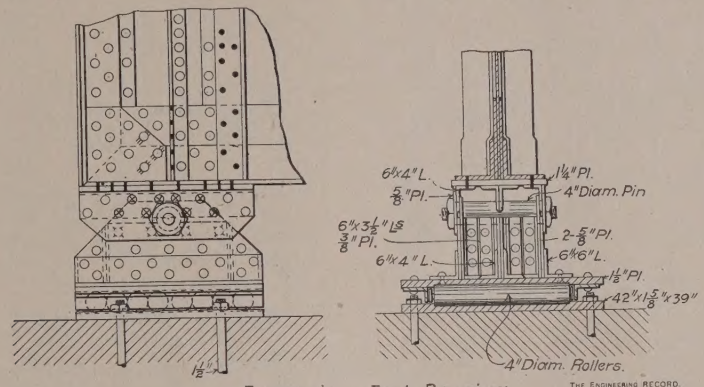
In addition to the falsework described above, the old bridge was trestled at panel points in the 20-ft. channel. The top chords of the old Phœnix column trusses were shored up from end to end by light timbers resting on the falsework, and the trusses were removed with a light movable gin-pole. The falsework in the 20-ft. channel was removed and the channel was open for navigation, the railroad traffic being carried across the canal by means of the old floor system supported on the timber bents and the temporary plate-girders.

The two main girders which were standing on cars near the site of the bridge were picked off the cars by a steam derrick wrecking car at each end of the girder. They were carried one at a time, swinging between the two wrecking cars, to the bridge site and lowered on to the masonry a little outside of their permanent position. On the next convenient Sunday the old floor system was torn out by a hand derrick car and the steam wrecking car, working from the center toward the ends of the bridge. One main girder was then jacked over into its permanent position, and the new floor system was assembled by the same cars, working from the ends of the bridge toward the center.

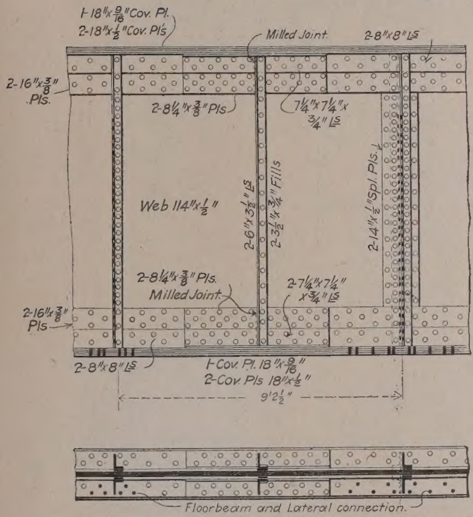
The floor system was displaced 4 in. longitudinally to give clearance between the two center floorbeams to enable the last panel of stringers to be easily put in position. The whole floor system was jacked longitudinally together into its final position and the other main girder moved into place. The remaining connections were bolted up and work was riveted together at convenience.

The track was laid on the stringers as soon as they were fully bolted and traffic was carried by the new span the same day that the old span was removed. The girders were painted with a red-lead paint shaded to chocolate brown with lamp black and mixed with raw linseed oil according to the standard formula adopted by the New Jersey Central and Philadelphia & Reading railroads.

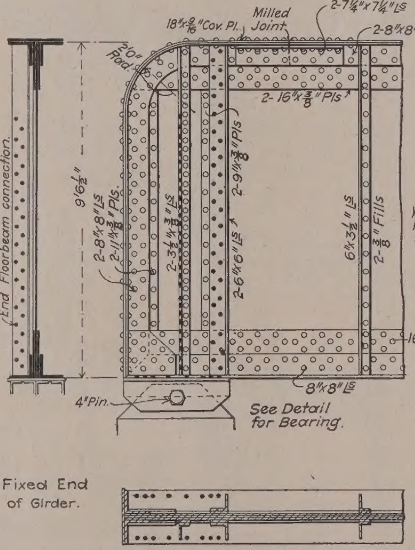
The bridge was designed and built under the direction of the engineering department of the Central Railroad of New Jersey, Mr. Joseph O. Osgood, chief engineer; Mr. A. E. Owen, assistant engineer, and Mr. Austin Lord Bowman, bridge engineer. Milliken Bros. were the contractors for the steel work, which was erected by the railroad company.



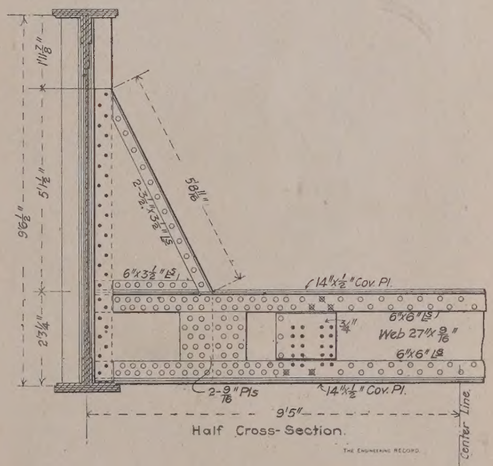
Expansion End Bearing



Intermediate Section and Splices.



Fixed End of Girder.



Half Cross-Section.

Details of Bridge over Lehigh Canal at Bethlehem Junction.

Heating in Connection With Condensing Engines.

Some interesting figures on the operation of the forced-circulation hot-water heating system, such as the Evans exhaust hot-water heating system, where the water can be forced through a heater in the exhaust of an engine operated condensing, were given in a paper presented by Mr. Reginald Pelham Bolton, of New York, before the American Society of Heating and Ventilating Engineers. In the course of a series of tests made by the author for the Department of Water Supply, Borough of Brooklyn, New York, last summer, at which tests Prof. Rolla C. Carpenter presided as referee, a record of the actual work obtained from such a primary heater was secured.

The pumping engine was a Worthington duplex horizontal triple-expansion jacketed type, having reheaters fed through the jackets, and being furnished with a primary heater having 60 sq. ft. of brass tube surface in the low-pressure exhaust close up under the point of emission. The condenser was some 20 ft. away from the heater.

Temperatures were obtained for varying quantities of water passed through the heater and these with the corresponding amounts of steam are given in the accompanying table. The first column gives the vacuum in inches of mercury as shown by gauge on the condenser; the second columns gives the amount of steam passed through the heater, and the third the amount of water passed through it. From the outgoing temperature and the noted increase in temperature, in the remaining columns, the incoming temperature of the water can be calculated. The lowest temperature in the cylinder, as obtained from the indicator card, was 149.65°, and that corresponding to the average vacuum was about 102. He concluded that the high degree of temperature in the water was due to the higher temperature of the point of release, which according to the diagram shown in the paper from one of the low-pressure cylinders, was 203.17°.

Data on Primary Heater with Condensing Engine.

Vacuum, in. Hg.	Lb. per min.		Temp. water, deg. F.	
	Steam.	Water.	Outgoing.	Incr'se.
27.8	.....	17.44	118.5	52
27.8	53.12	12.4	119.5	53
27.8	50.12	11.59	120.5	54
27.8	53.62	11.59	121	54
27.8	53.62	11.59	121	54
27.9	51.62	11.59	121.2	54.2
27.9	61.28	7.8	122	55
27.9	54.12	4.98	126	58
27.9	61.28	2.49	124	56.5
27.9	59.28	.162	126	58

He also gave some figures covering the operation of an Evans system at the Miami (O.) light, heat and power plant. From Oct. 12 to 22, inclusive, last year, the average temperature of the weather was 51.7° Fahr.; the average vacuum, 21.74 in.; the average temperature imparted to the heating water, 132.5°, and the average temperature increase imparted to the water in passing through the heater, 3.8°. From Oct. 23 to Nov. 22, inclusive, the average temperature of the weather was 45.33°; the average vacuum, 20.82 in.; the temperature of the heating water, 143.8°, and the average increase of temperature imparted to the water in passing through the heater, 4.24°. The effect on the engine of raising the temperature of the heating medium was illustrated by the following record: On Nov. 4, when the outside average temperature was 51.1°, the temperature of the water was 131.5° and the vacuum, 22.52 in. On Nov. 8, when the outside temperature was 43.7°, the temperature of the water was 141.1° and the vacuum, 19.19 in. On Nov. 11, when the temperature was 32.2°, the temperature of the water was 144.3° and the vacuum, 18.75 in. On Nov. 14, when the outside temperature was 31.6°, the temperature of the water was 153.2° and the vacuum, 15.13 in.

While the application of hot water as a means of utilizing for heating purposes the heat of the low-pressure exhaust from condensing engines was treated at some length, the paper was a discussion of the subject from the standpoint as well of steam heating in connection with condensing engines. The author referred to the application of the Webster vacuum system in connection with engines which are thereby enabled to expand fully to atmospheric pressure, but his paper was mainly offered as a suggestion of a line of probable development.

The Mechanical Plant of the Bellevue-Stratford Hotel, Philadelphia.—IV.

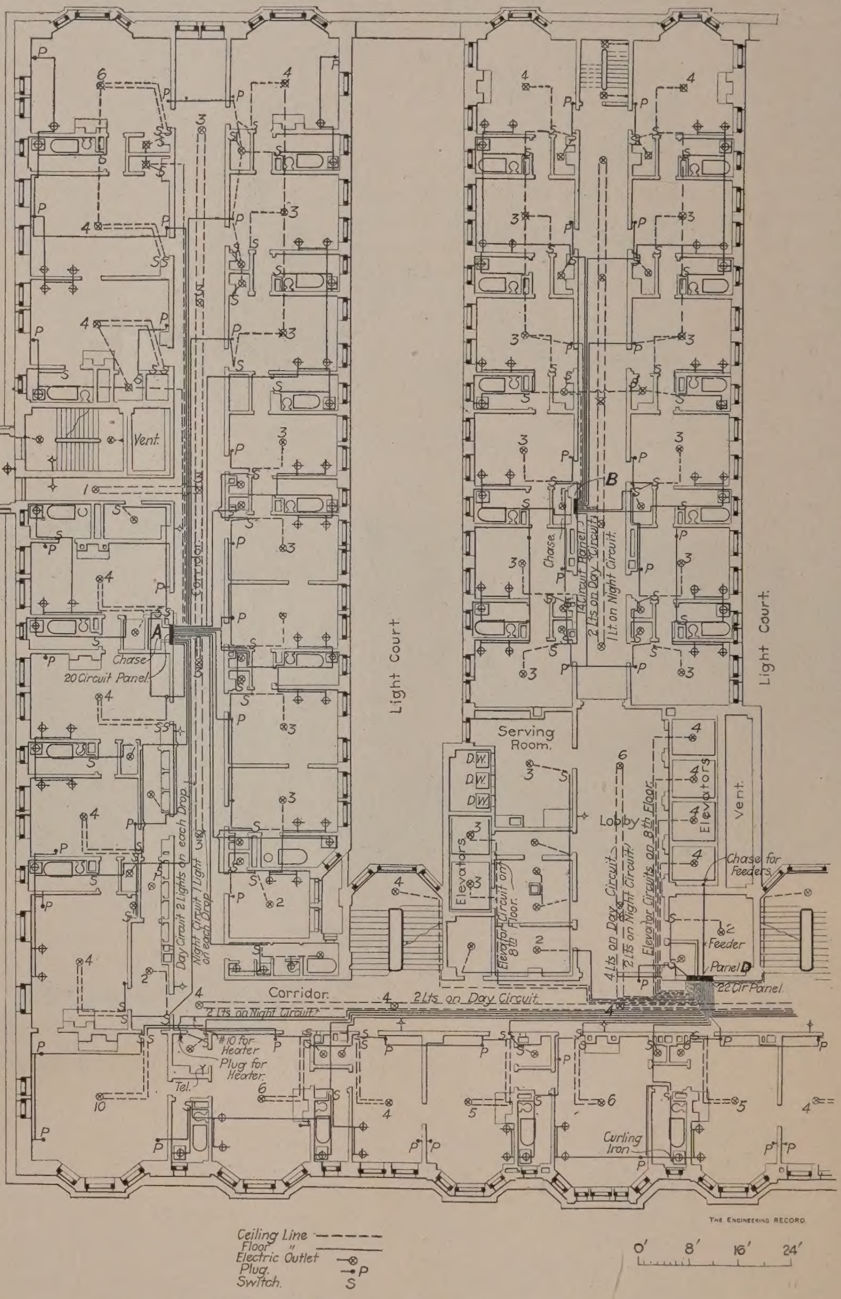
Electric Lighting and Power.—The electric plant is designed to supply about 13,000 lamps of 16 c.p., 530 electric heaters for curling irons and electric motors aggregating 320 h.p. in capacity, besides some 1,118 plugs for portable connection to the electric distribution system. These figures apply to the building when fully completed, the rear ends of the three wings not yet having been continued above the ballroom ceiling. It will be of interest to describe briefly the distribution of lights on the typical floor of the hotel and also to discuss some of the noteworthy details, such as the lighting of the palm garden and of the ball room. As already stated the plant was designed by Francis Brothers & Jellett, Inc.

The typical floor contains 53 guests' rooms and 40 private bath rooms. All the guests' rooms are equipped with an electrolier in the center, containing from 3 to 6 lights each, and, as a rule, two wall-braket lights. The three-light chandeliers are in the rooms along the courts; four-light chandeliers are furnished in rooms along the side streets, these rooms being somewhat larger and more pretentious than the court rooms; four, five and six-light chandeliers are given to the rooms along the Broad St. front, while the two front corner rooms on each floor have a ten-light fixture with no wall brackets, these rooms being planned to serve as dining rooms as a part of the suite with the adjoining bed chambers. In all cases part of the lights of every room are connected on one circuit and the rest on a second. Except the court rooms, these central lamps are controlled by two switches, one in general supplying one or two lamps of the fixture and the other supplying the remainder. These switches are located at the corridor door, the switches being 4½ ft. above the finished floor. The bracket light are 5 ft. 3 in. above the floor and are 5 ft. apart. Two lights are provided over the basins in the bath rooms, outlets 7 ft. 6 in. high from the floor, with toilet bracket dropping lower. The clothes closet of each room is provided with a light which is controlled by a separate switch located inside of closet. The more important rooms are provided with two plugs, while those along the courts have one plug.

The wiring of floors above the second is fed from four points, at each of which there is a panel box; below the second floor the wiring is fed from many distinct points. One of the four general rising points is situated in the center of the front or main portion of the floor and supplies the entire front and the lighting of the elevator hall or lobby. The remaining three are each more or less centrally located in the three wings. The main panel, served from rising point D, distributes to 22 circuits on the typical floor, with four additional circuits on the eighth floor for the lights in the elevators. Each of the outside wings is served by 20 circuits, while for the central wing 14 circuits suffice. The circuits from the panel boxes are run directly to the ceiling outlets and from these outlets the lines drop to the switches. Brackets and plugs are generally carried on separate circuits fed from the floor upward. The hall-light circuits are, of course, carried altogether at the ceiling line, and are, as usual, arranged on two circuits, one for the night lights. The lobby at the elevators is supplied with six-light electroliers and the main corridor with four-light fixtures, in each of which two lights are connected on the night circuit and the remainder on the day circuit. In the wing corridors there are three-light fixtures, with one light in each case on the night circuit.

The total number of lights on the typical floor, not including connections to the plugs, amounts to over 550, so that for the total floor area enclosed by the outside walls, there are about 47.4 sq. ft. of floor area per light. The total number of lamps in the guests' apartments on the typical floor, that is, not including the lighting of the halls and other public parts, is about 475, and for the 20,000 sq. ft., more or less, of floor area comprised in guests' chambers and bath rooms, there are 41.5 sq. ft. of floor area per light. On the basis of the cubic contents of the entire building, assuming the total number of lights at 13,000, there are 600 cu. ft. of space per lamp of 16 c.p.

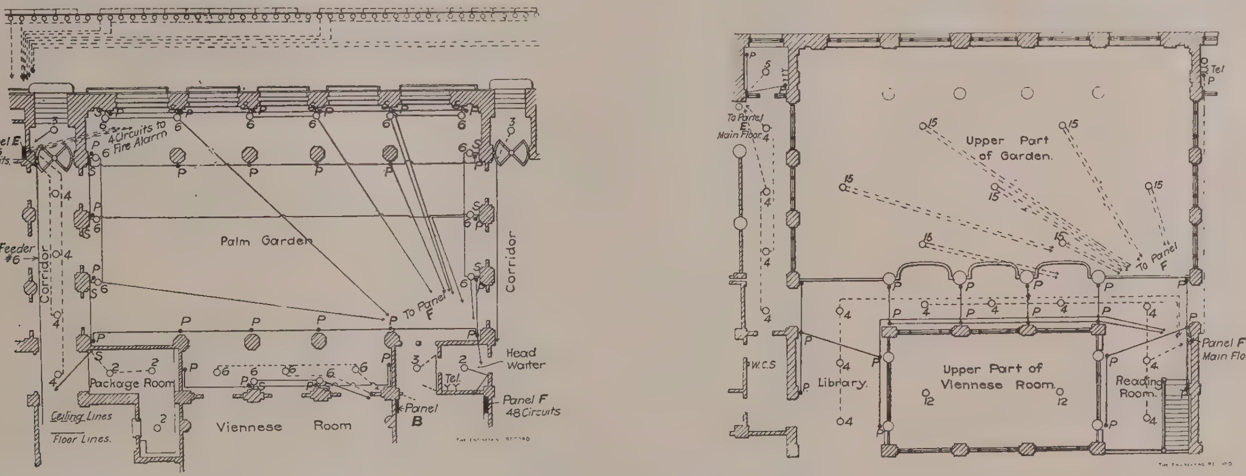
Among the portions of the building where a high degree of illumination is provided is the palm garden which, it will be recalled, lies at the rear part of the main floor with a 20-ft. clear inside height. It is approximately 47x80 ft. in plan. At every pilaster on three sides of the room, twelve all told, there is a six-light bracket, 5 or 6 ft. above the floor line. In the ceiling of the garden there are seven large groups of fifteen lamps each. This makes a total of 177 lamps of 16 c.p., or one lamp for 21 sq. ft. of floor area. At every pilaster around the four walls and at the columns rising through the room there is a plug at the floor line for the attachment of local illumination on the dining tables. All the circuits are controlled from a panel box near an inside corner of the room and from this panel box there are also run circuits to the rooms adjacent to that end of the palm garden, this panel having 48 circuits altogether. The bracket circuits, as well as those to the plugs, are, of course, run at the floor line, while the others are supplied from the ceiling circuits.



Part Plan of Typical Floor Showing Wiring.

Along the alley at the rear of the hotel and extending from the rear entrances on the side streets is a canopy under which vehicles may be driven to the rear entrances on the main floor. Lamps are spaced along the outside edge of the canopy at distances of about 26½ in. on centers. Ten circuits all told were required for the lighting of this canopy, and every other light is on one circuit, those in between being on another, so that the lamps alternate with respect to the circuit supply. The most distant lamp is probably 170 ft. from the panel box which controls it, this panel box containing 76 circuits and supplying also the illumination to the main entrance to the ball room, which lies at the opposite end of the palm garden from that referred to. It may be stated in passing that the upper part of the ball-room entrance is illuminated from four 23-light electroliers. Over the steps to this entrance and over that to the rooms at the opposite end of the palm garden is a canopy in each case lighted with lamps spaced about 13 in. on centers.

The ball room, however, possesses the greatest concentration of illumination, having some 1,344 lamps for a room of about 8,150 sq. ft. of floor area, or one lamp for 6 sq. ft., or counting the gallery floor as additional floor space, there is one lamp for 10 sq. ft. As already described, this gallery extends around all four sides of the room, and underneath it, behind the columns which serve in part to carry the gallery, is a promenade on both the main and gallery floors. An accompanying plan of the upper portion of the room will serve to indicate the disposition of the lighting. In the cartouche over the caps of each of the columns, 20 all told, there is provision for 15 lights in each case. In the cartouche in the ceiling panels there are sixteen outlets for twelve lights in each case, the relative location of these being indicated in the smaller of the dotted-line rectangles. On the front of the boxes and the part of the gallery reserved for the orchestra there are 29 outlets for twelve lights each. In the cove of the cornice around the room there is a continuous rectangle of lights, 220 all told, controlled alternately with respect to the circuits supplying them. Behind the columns in the gallery there are sixteen eight-light bracket outlets and two ceiling outlets at opposite ends of the room, also for eight lights each. This makes a total of 1,204 lights in the upper part of the room. Under the gallery fourteen of the columns are provided with eight-light brackets, there are two eight-light fixtures underneath the orchestra and a twelve-light ceiling fixture at the opposite end of the room under the gallery, making a total of 140 lights, or a grand total for the room of 1,344 lights.



Wiring of the Palm Garden of the Bellevue-Stratford Hotel.

The orchestra portion of the gallery is designed to be lowered toward the floor line, as already mentioned, to serve as a stage for dramatic entertainments, and for this purpose it is equipped with vertical screws by which it is raised and lowered as desired. This fact has made necessary the provision of plugs for illuminating the front when it is in its up position as the orchestra's gallery and for supplying foot and border lights when it is utilized as a stage. In the latter position it is to be furnished with a false front in which will be arranged the foot-lights with circuits for the different colored lamps that may be employed, and there are three circuit plugs at the bottom of the column on each side for this purpose and also three three-circuit plugs for the border lights. At the gallery opposite the stage are two 50-ampere plugs provided specially for operating an electric lantern for projecting light upon the stage.

The ball room has a complete stage switchboard. It is of white Italian marble, and controls the entire ball room lighting. This board is made up in two sections: (1) the switchboard proper, standing immediately in front of (2) panel board section. All circuits are carried directly back to the panel board section and there individually fused, and grouped, and the feeds are carried over to the switchboard. Each group of lights has switch and dimmer, the dimmer handle being located directly above the switch. The dimmers are of the Wirt universal interlocking type, with the resistances mounted on a separate slab back of the board and operated by bronze cables run from the levers to the resistance grids. The levers are arranged in four banks, one for each of the three colors on the stage, red, white and blue, and one bank for the auditorium. Each dimmer circuit has a pilot lamp directly above, arranged in the form of a receptacle set so that the lamp comes flush in the marble. A hand wheel for slow motion is provided for the dimmers. Few theatres in the country have a more complete switchboard than is here installed.

The total motor-connected load aggregates 320 h.p. Most of this is comprised in the heating and ventilating equipment, where, as already stated, there are 20 fans requiring a total of 194 h.p. in the motors to drive them. Besides these there are five motors aggregating 62 h.p. in the laundry, including a 55-h.p. Sprague motor driving shafting by belts; 15-h.p. Diehl for driving the Exeter coal conveyor, and the following miscellaneous equipment: 4.7 h.p. for a motor-generator in connection with the bell and fire-alarm system; two 3-h.p. motors for ice-cream freezing; three motors aggregating 4 h.p. for the silver buffers; two 5-h.p. motors for dish-washing machines; one 3-h.p. motor for the butcher shop and one 1-h.p. for the electric pump supplying distilled drinking water. The fan motors throughout were built by the Diehl Manufacturing Co. Each motor is supplied through a small panel located near it and on this panel is mounted a double-pole fuse switch and single-pole circuit breaker.

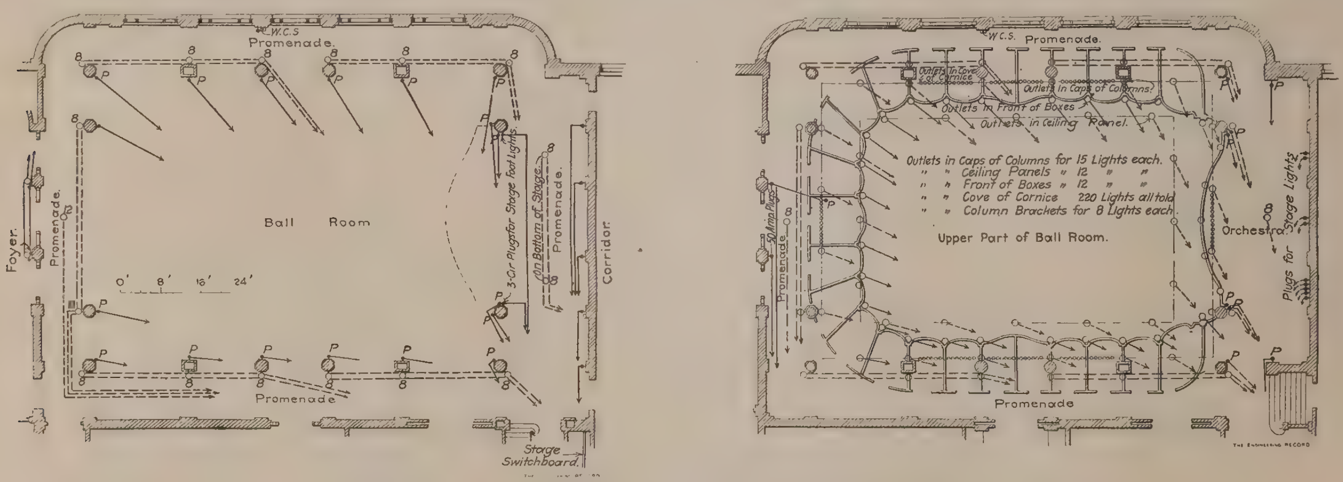
Incandescent lamps of 110 volts are employed practically throughout the building, but a number of enclosed arc lamps for this voltage are in use, mostly in the laundry. This room, located in the sub-basement, has an area of over 6,500 sq. ft. and is illuminated from twelve arc lamps of this character, furnished by Jandus Electric Co., so that there are 543 sq. ft. per arc. In addition to these lamps there are, however, fourteen incandescent lamps, but these are mostly suspended on flexible connections for local lighting at the various laundry machines. Each arc is on a separate circuit.

The feeders were calculated on the basis of about 0.55 ampere per lamp, 1½ amperes for each curling-iron heater, and 8 amperes per horse-power of the motors; generally a pressure drop of 3 volts is allowed for. The notable exception is the calculation for the feeders to the lighting of the general floors from the second to the sixteenth inclusive, and for the feeders to motors. Here, in every case, 5 volts' drop was allowed. Branch circuits were given 2-volt drop. The assumed working conditions and some of the characteristics of the lighting feeders are given in the accompanying table. In each of the four rising points there are three feeders, each feeder supplying the lights on five floors. Each feeder is run, in the usual way, to the central floor of the group it supplies, and sub-feeders connect up and down with the corresponding panel boxes for the other floors of the group of the five in question. The single distance of the central box from the switchboard is noted for each feeder, the cross-section of each of the pair of conductors, the size of the pipe through which each wire is carried from the switchboard to panel box, two pipes per feeder, and the ampere load on which the calculations are based, the load being the largest possible with allowance for addition. Loricated conduit was employed for carrying the circuits, and simplex wire was used.

Table of Lighting Feeders for the Upper Floors.

No.	Single length, ft.	Cross-section, cir. mls.	Pipe size, in.	Floors, inclusive.	Amperes.
		Riser Point A.			
10......	225	700,000	2	2—6	500
11......	285	750,000	2	7—11	533
12......	350	750,000	2	12—16	483
		Riser Point B.			
15......	190	400,000	1½	3—6	308
16......	260	500,000	1½	7—11	371
17......	325	550,000	2	12—16	335
		Riser Point C.			
30......	185	750,000	2	2—6	515
31......	250	750,000	2	7—11	533
32......	315	700,000	2	12—16	483
		Riser Point D.			
21......	140	700,000	2	2—6	545
22......	205	750,000	2	7—11	525
23......	270	700,000	2	12—16	499

The generating plant, it will be recalled, comprises four 250-kw. units, each consisting of a 23x42-in. simple Corliss Allis-Chalmers engine and a 125-volt Western Electric generator direct driven at 100 r.p.m. The dynamo leads are of paper-insulated, lead-covered conductors and run directly to the main switchboard under the engine room floor. The switchboard is arranged with the generator connections in the center and the feeder panels at each end. Altogether it is 29 ft. in length and 7 ft. 6 in. high. The power section of the switchboard is not separate and distinct from the lighting side, but the switchboard is arranged practically symmetrical on each side of the generator section. It was originally laid out to have the power supplied from one side and the lighting supplied from the other, but there being no manifest benefit arising from this arrangement, the scheme was abandoned and the board made symmetrical. The connections of the four generators are grouped on three panels. Each main switch is of the three-pole single-throw type, thereby including the equalizer connection and the four switches are arranged in a horizontal line across the middle of the panels, two switches on the middle panel and the line of four flanked on each end by a recording watt-meter, one watt-meter for registering the flow of current to one-half the board and the other for registering the current to the other half. An ammeter is provided for each machine at the upper part of the panels, and there is a circuit-breaker below each switch. In addition to the ammeters there is a voltmeter with multiple-point switch, a ground detector and a differential voltmeter. All the feeders are connected through double-pole single-throw switches and each is provided with an I. T. E. circuit-breaker made by the Cutter Electric Co., all except the smaller ones being of the laminated type. At each end of the switchboard there is a bracket voltmeter.


W.C.S.
Promenade.
8
P
Foyer.
Promenade.
Ball Room
0′ 8′ 16′ 24′
3-Cir. Plugs for Stage Foot Lights.
On Bottom of Stage.
Corridor.
Promenade
Stage Switchboard.
Outlets in Cove of Cornice
Outlets in Caps of Columns.
Outlets in Front of Boxes
Outlets in Ceiling Panel.
Outlets in Caps of Columns for 15 Lights each.
" " Ceiling Panels " 12 " "
" " Front of Boxes " 12 " "
" " Cove of Cornice 220 Lights all told
" " Column Brackets for 8 Lights each.
Upper Part of Ball Room.
50 Amp Plugs
Orchestra
Plugs for Stage Lights
The Engineering Record

Wiring of the Ball Room of the Bellevue-Stratford Hotel.

The feeders are carried vertically upward from the switchboard into a junction box at the ceiling line behind the board, where a rearrangement of the feeders is made, so that all the exposed work presents a good appearance. The junction box is approximately 3x3 ft. in cross-section and in length the length of the switchboard and is constructed of 1½-in. oak furnished with a paneled bottom hinged and fitted with locking clamps. From the junction box the feeders run in conduit to the various rising points. As already stated, the feeders consist of two wires, each in a separate tube. The panels throughout the building are set in oak cabinets 1 in. thick, with doors of plate-glass. Cartridge fuses are used throughout.

The Bell System.—On the main floor is located the main annunciator. This annunciator is of the Partrick, Carter & Wilkins needle type, and has 945 drops, divided up into fifteen sections. One section takes care of everything below the second floor; another section is provided for each floor from the second to the fourteenth, inclusive, and the last section has indications for the fifteenth and sixteenth floors, which are combined. On the lower floors buttons indicate directly on the main annunciator only. On the room floors, an annunciator of about 64 points is provided in each of the floor offices. Each of these annunciators is in multiple with its corresponding section of the main annunciator, so that both indicate at once. The main annunciator has an indication on each section operated from a button on the corresponding floor office annunciator, showing the call has been answered from the floor office, and each section of the main annunciator is correspondingly arranged to show to the floor office attendant that the call has been answered from the main office. Each floor office annunciator has a button board directly below it and made a part of the annunciator. This button board controls an annunciator of the same size as the floor office annunciator, located in the pantry of the corresponding floor.

The system of wiring for the bell system is conduit throughout; the buttons are grouped together five or six on one line, and carried back to a junction immediately back of the floor office annunciator. From here the multiple lines are carried together with the indication wires to the pantry annunciator, and passed down the wire shaft to the main annunciator. From this point they are supplied with battery by means of trunk lines from the bell power switchboard in the sub-basement. Each section of the main annunciator, and, of course, the corresponding floor annunciator, is supplied with a separate battery wire, controlled by a switch on the bell power board, so that it is possible to cut out any section without interfering with the rest of the service.

The bell power switchboard is quite an affair. It is divided into four panels; one panel has the feeder switches through which current is supplied to the bell system, fire alarm system, etc. The second panel has the meters, breakers, starting boxes, field rheostats, and motor and generator switches for the two motor generators supplying the entire bell and fire alarm system. The next panel provides the instruments and apparatus for the two motor generators supplying the elevator signaling device. The fourth panel is similarly arranged for the control of the motor generator which supplies current to operate the valves of the pneumatic tube service. In addition, upon this panel are located the breakers, and switches for the storage battery. The board is arranged by means of double throw switches, so that either of the motor generators or the storage battery can run the bell system, or the battery can be charged, or any desired combination can be made.

Fire Alarm System.—In the office on the main floor is an 80-point annunciator which indicates from fire alarm boxes distributed through the building. On the room floors are four boxes, one in the center of each wing, and one in the center of the front corridor. On the other floors they are located at various necessary points. Immediately above each box is placed an 8-in. vibrating bell. The breaking of a glass on one of the boxes sends in an alarm to the annunciator in the main office. This, however, does not start the large bells. These are operated by four sets of rotating switches located in the annunciator. One switch rings bells in upper part of the building, another switch operates the lower floors and the other switches the middle section. When an alarm comes in from any box, the office thus has a chance to investigate and to avoid turning in a false alarm which is a very serious matter in a large public building. The current for operating the fire alarm system is supplied from the bell power system in engine room.

Watchman's Clock System.—The watchman's clock system is a magneto system, and consists of a Holtzer-Cabot clock, operating from seventy-five stations located throughout the building. This system being entirely magneto, requires no external battery.

Telephones.—The telephone system in this building is more extensive than in many large size towns. The wiring throughout is in conduit, five or six 'phones being grouped on a circuit or line. These lines carry back to a main junction on each floor near the passenger elevators. From this point the trunk lines are run to the main switchboard. The conduit system is arranged for one main switchboard, of about 1,000 drops. Sixty-nine 'phone outlets for the use of officers and executives of the building are grouped to a central point, so that it would be possible to install a small exchange for these particular 'phones. There are also many direct 'phones between various points requiring direct service. In the bedrooms the 'phones are of the desk pattern, and are connected from a plug in the washboard, so that the 'phone may be carried anywhere in the room. This arrangement also applies to many of the other 'phones; in fact, there are few wall 'phones in the whole installation. The Bell Telephone Co. is now operating the system, and has installed a switchboard with provision for 1,000 drops.

A Turbine-Driven Gas Exhauster has been installed at Dover, England, by the Sturtevant Engineering Co., for the delivery of gas from a storage holder to two distributing holders 1½ miles distant. The steam turbine runs at 32,000 r.p.m. and the exhauster at 4,000 r.p.m.

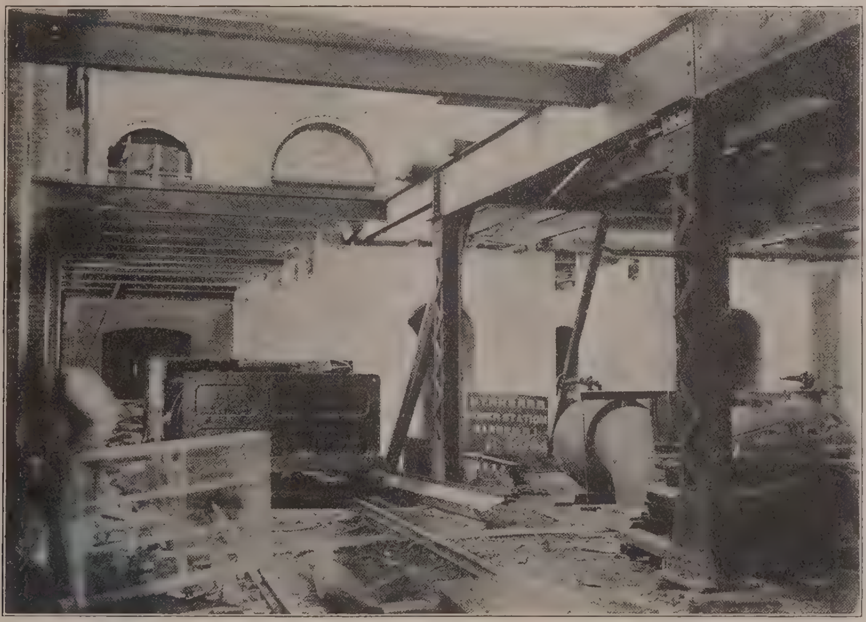
Steam-Turbine Power Plant of the New York, New Haven & Hartford R. R., Warren, R. I.

A steam-turbine electric generating plant that is noteworthy from the directness of the steam lines and the absence of a multiplicity of pipes has been added to the power station at Warren, R. I., of the Fall River branch of the New York, New Haven & Hartford R. R. It is substantial evidence of the rapid growth of the electric service instituted by that company, for in the brief period since 1900, when electric transportation was introduced between Providence and Fall River and Bristol, the company has, for the second time, found it necessary, owing to increased traffic conditions, to make additions to its power equipment.

Warren is situated somewhat centrally with respect to the termini, the distances from the power station to Providence, Bristol and Fall River being 10, 4 and 9 miles, respectively. Until this latest provision for additional power was made, direct current only was delivered from the plant, at 650 volts, and in connection with its transmission over the relatively long distance to the points of heavy demand, storage battery stations were maintained, one at East Providence and the other at Brayton, Mass., near Fall River. The direct-current machinery consisted largely of two 800-kw. direct-connected steam-engine units.

To provide for the additional power for which, as stated, a need had developed, a contract was made with Messrs. Westinghouse, Church, Kerr & Co., engineers, of New York. It was decided to employ alternators giving current directly at 13,200 volts, using Westinghouse-Parsons steam turbines for driving the alternators, to erect rotary sub-stations adjoining the storage battery plants and to connect the direct-current with the alternating-current system by means of a rotary converter in the power house, arranged to remain floating on the line, so that either system could assist the other according to the distribution of the load. The direct-current plant is, of course, planned to supply mainly the sections of the railway nearer the power station, so that the alternating-current machinery may be drawn upon when the load in that vicinity is unusually high, and vice versa, the direct-current part of the station may, through the converter, serve the distant points. It is noteworthy that both the substations and the power house building extension, which have accordingly been built, are of fireproof construction throughout, with brick walls, concrete floors and steel roof frames, the last carrying, in the case of the power station addition, a roof of Ludowici tiles, and in the case of the substations, roofs of reinforced concrete.

The power station addition is practically 100 ft. in length and conforms to the general lines of the old building. It is divided, as shown in the accompanying drawings, into a boiler room, one story in height, housing the boilers and steam lines, and an engine room, two stories in height, containing on the second, or main floor, the steam turbines and electric generating apparatus, and on the basement floor the condensing apparatus, electric cables and transformers. Along the outer wall of the boiler room is a coal bunker, which is a continuation of that along the older section of the wall. Coal cars are run on an elevated track over the bunker, and the coal delivered from them into it passes by gravity through openings in the bottom of the building wall along the firing space in front of the boilers.



Turbine Foundations in Power House Basement, during Construction.

In the boiler room there are four Babcock & Wilcox water-tube boilers of 400 h.-p. capacity each, arranged in two batteries, with space for a third battery. The boilers are connected with two mains, one of which supplies steam to the turbines, and the second, or auxiliary, steam main, carries steam to the boiler-feed pumps, air pumps and an exciter engine. With this system of piping any derangement of the steam connections to the auxiliary apparatus in the station will not interfere with the operation of the steam turbines. The normal operating pressure is 150 lb., and all the boilers are arranged for the installation of superheating apparatus when desired.

The products of combustion are carried through a brick duct immediately back of the boilers, leaving enough space below the duct for the blow-off connections. The top of the duct is flat and is built of brick, supported by T-bars spanning the duct. The smoke-stack is outside the building and is of the self-supporting steel class, 130 ft. high and 9 ft. in inside diameter. It was built by the Coatesville Boiler Works, of Coatesville, Pa., and rests on a masonry base 20 ft. high, through which the smoke duct reaches the steel shaft. The effective height of the chimney is 148 ft. above the grates. The base is octagonal in form and is built of concrete with outside and inside brick walls, which were made to serve as forms for the concrete filling.

The water for the boilers is handled by two 12x7x12-in. Warren duplex horizontal outside-packed pumps, which receive their supply either from the city mains or from a deep well located on the premises. They deliver ordinarily through a feed-water heater, which receives the exhaust from the pumps, condensers and exciter engine, but the heater may, of course, be by-passed when desired. It is of the closed type, with single steam connection, and was built by the Goubert Manufacturing Co. It is placed horizontally overhead between the two batteries of the boilers, and alongside it is the outboard exhaust for the excess steam from the auxiliaries.

The leading characteristics of the piping work have already been mentioned. It will be noted that each end of the main steam header is closed with an elbow pointing downward and fitted with a blank flange to form a drainage pocket; and the high-pressure lines are all drained by means of the Holly system. The connection from each boiler is, as usual, provided with two valves, and one of these, over the boiler, is a Pearson automatic non-return stop valve. The auxiliary header, however, is placed in the engine-house basement and is supplied from opposite ends of the present auxiliary steam main that extends across the front of the boilers. The two connections for this purpose, 4 in. in diameter, are joined at the station partition wall by a connection from the main steam header, so that the auxiliary header may also receive steam from the main source. These connections and the two pipes which drop through the generator room to the auxiliary header are shown in the cross-section drawing of the station. Though in general the various lines are carried to their destinations with a limited number of bends, it is held that expansion and contraction have been amply provided for.

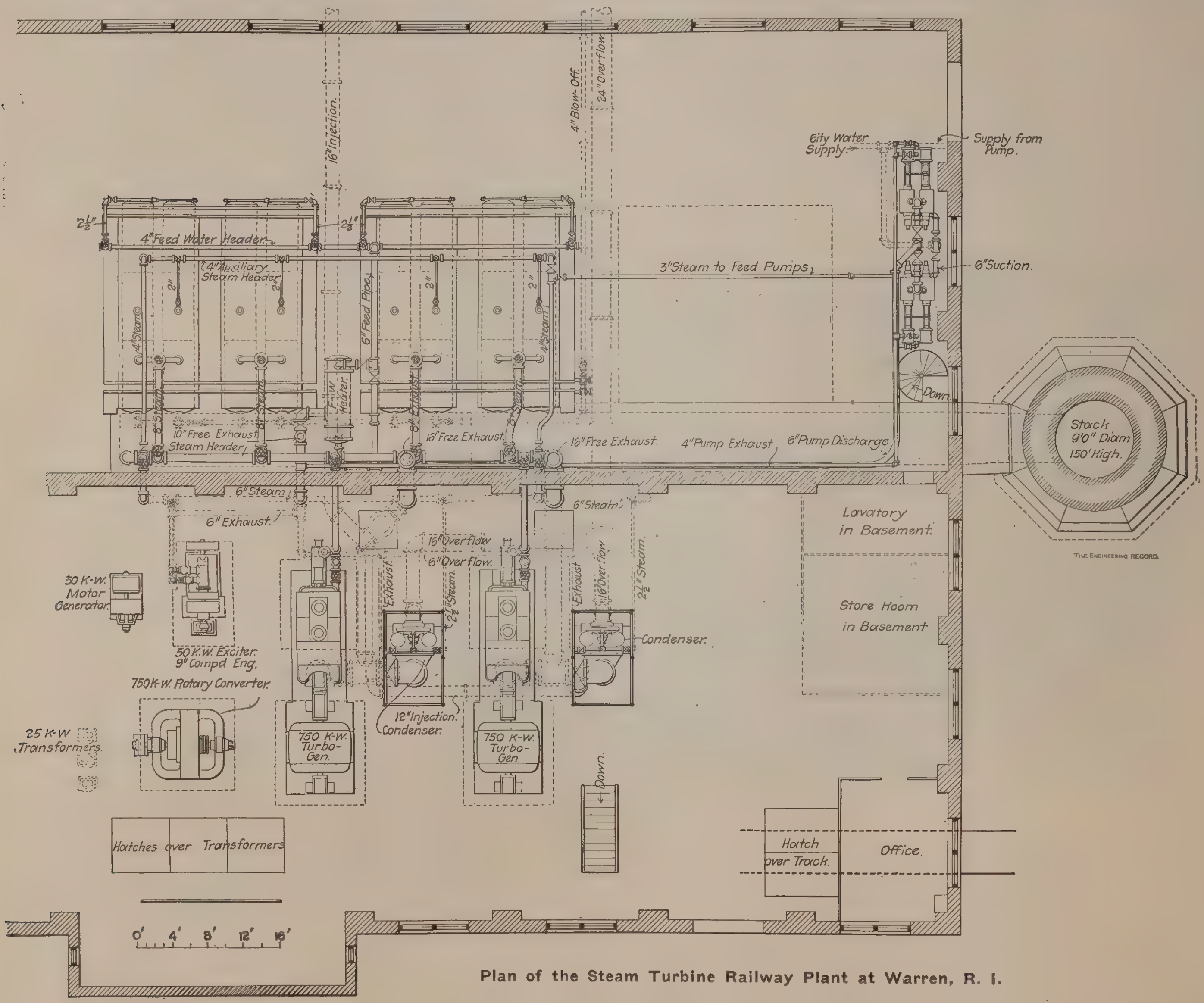
The generator room contains two 750-kw. turbo-alternators with space for a third unit of the same size. They operate at 1,500 r.p.m., giving an alternating-current output at 13,200 volts, as stated, and they are guaranteed to develop an electrical horse-power-hour on about 16 lb. of steam when exhausting into a vacuum of 26 in. They are also rated with a capacity to carry 100 per cent. overload. As usual with this type of generating unit, no foundation bolts have been employed, the machines simply resting on a concrete base. These are indicated in an accompanying view during construction, which shows the archway that is possible through the foundation work, increasing the accessibility of different parts of the basement.

Each turbine is connected to an independent condensing plant, with the usual arrangements for operating either condensing or non-condensing. Each condensing unit consists of a Warren vertical twin air pump and jet condenser located adjacent to the turbine, but on the engine-house basement floor, there being an open hatchway over each machine, so that the operating attendant has a full view of all the apparatus. The condensing plant is supplied with sea water from the Warren River, and an intake well has been built outside the building for the suction ends of the injection pipes of both the old and the new parts of the station. It was first intended to lead the water from the river to the well through a flume, but an intake bay is now being dredged to bring the water to the well through a short canal. Entrance to the latter will take place through a 4x4-ft. opening fitted with removable screens formed of maple frames and No. 8 galvanized-iron wire on a ½-in. mesh.

The rotary converter is of the capacity of one of the turbo-generators, or 750 kw. The transformers used with it are located in the basement. The new equipment includes a motor-driven exciter, as well as a steam-driven exciter. Both are of 50 kw. capacity at 125 volts, and the engine of the latter is a 9 and 15x9-in. Westinghouse compound engine.

The switchboard is of blue Tennessee marble, supported on a steel frame. High-tension switches are of the oil-bath type, and all uninsulated parts of the switchboard connections carrying high-pressure current are enclosed in the usual fireproof compartments, reducing the danger to the attendants. Cables and wires otherwise are run on insulated supports on the basement ceiling, leaving the engine-room floor free from obstructions.

Each of the substations will contain triplicate units of 300 kw. each, including both static transformers and rotary converters for supplying 500-volt direct current to the trolley lines. One, two or three of the converters can be placed in operation as required. The same care has been shown in arranging the electric apparatus and circuits in these stations as in the power station. In conclusion it may be said that the station stands as an instance of rapid construction, the excavations for the stack foundations, which were first undertaken, not being started until Aug. 15, 1904, and the first turbine being turned over by Dec. 21. The first substation was started Dec. 28.



Plan of the Steam Turbine Railway Plant at Warren, R. I.

Methods of Figuring Costs.

A paper read before the Michigan Engineering Society by Mr. C. E. Bement, Lansing, Mich.

One of the most important subjects of discussion in the manufacturing business to-day, is that of cost of the product, and the best method of ascertaining that cost. The increased importance of this subject has come from the necessity of knowing just what your article may be sold for and produce a legitimate profit, inasmuch as it is no longer possible to reckon on the large profit of thirty or forty years ago. For if you fix your price above a legitimate profit, you will lose your trade, and if you fix it below a legitimate profit, you will lose your money.

The secondary manufacturer (and by this term I mean he who uses the partially finished product of a primary manufacturer, such as steel bars, manufactured lumber, etc.,) finds himself buying all his raw materials of trusts and combinations of various kinds, who have practically throttled competition and increased the cost of his raw materials; forced him to pay cash for everything and made all his buying more difficult and expensive by numberless petty restrictions. On the other hand, competition has forced him to sell on closer margins, on longer time, and with more liberal guarantees. So, too, his labor through combination and the passing of more liberal laws demand higher wages, and better shop conditions. All these adverse influences force the secondary manufacturer to give more attention to his cost system, and through the knowledge so obtained, to better his methods of manufacturing, by greater economy in shop management, new and improved, and generally, more expensive machinery, and by the reduction of non-productive labor to the lowest point.

It is almost impossible to lay down any fixed rule for figuring costs that will apply to more than one branch of manufacturing. This is the reason that a great deal of writing on this subject has been futile, with the exception of a few generalities which are fairly axiomatic. Every man must work out his own salvation as to his cost figuring, and it sometimes happens that it does not prove to be salvation. Machine shop practice has perhaps more than any other branch of manufacturing been brought into some systematic method of cost keeping, but in the line of manufacturing in which I am interested, the subject is still in a somewhat chaotic condition, as near as I can find out by comparing notes with fellow manufacturers. In shops where a limited number of articles are made, it is a comparatively simple thing to get a shop cost, but in a shop making

$1,000,000 worth of goods per annum, and anywhere from five hundred to a thousand different articles, it presents some very difficult problems, not the least of which may be the necessity for keeping your system simple enough so that it does not take a large corps of experienced men to keep it up.

There are two principal methods of cost figuring; one called the continuous system, in which every piece is figured every time it passes through the shop; and the other the individual system, in which every complete tool, or article is figured as a whole without attempting to keep track of every time the parts of that tool are made in the shop. The latter, or individual system, is better adapted to exclusive piece work shops, and is the one employed by me in the establishment with which I am connected.

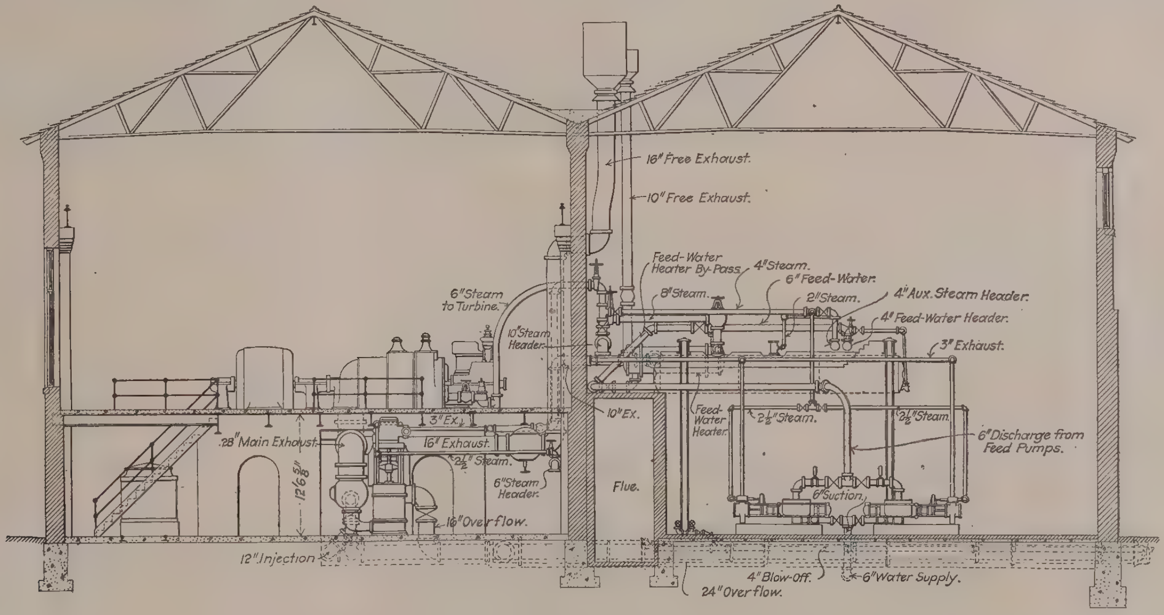
Cost keeping of this kind has several elements: First, the cost of raw material. Second, cost of labor directly put upon that raw material, or the productive labor. Third, the cost of the labor not directly put upon that material, but indirectly in the shape of handling or other manipulations, which does not add to its value or carry it along toward completion, or non-productive labor. Fourth, the items of shop cost under such heads as files, drills, emery wheels, and the infinite variety of small items which although negligable in the cost of one article are not a negligable quantity in a year's business. Then comes the large item of secondary shop cost, what in our institution is called "superintendence and power," including the salary of the superintendent and his assistants in the office; the foremen and their assistants in the shop; watchmen, engineers, firemen, pattern shop, repair shop, shipping department, stock room, yard help, teams and teamsters and their keep, fuel and light, and so on and so forth. In our method of cost keeping, these items are put under one head and added to the labor and material as "superintendence and power, or factory, per cent." Last of all, a percentage must be added that will cover all of the other expenses of doing business, and this will include a large number of items, such as bad debts, insurance and taxes, advertising, stationery and printing, cuts and electrotypes, interest, discount, general expenses, commissions, rebates and allowances, postage and telegraph, your office pay roll and expenses, your salesmen's salary and expenses; all of which items will amount to a percentage ranging anywhere from 25 to 40 per cent. This last percentage is called "sales per cent.," and after it has been added you have still to add the percentage of profit that you think the tool will stand in the market, and you have then your selling price.

These two percentages, "superintendence and power per cent.," and "sales per cent.," are obtained by finding what you actually spent for these items in your previous fiscal year, and finding what per cent. they are of the actual expenditure in that year for labor and material. To supply a concrete example: If for the year 1904 you spent $200,000 for labor and $300,000 for material, and the items of superintendence, foremen, watchmen, fuel, etc., as itemized above, amount to $60,000, your "superintendence and power per cent." is 12 per cent., which must be added to the shop cost of every tool to make it bear its proportion of the total year's expenditure for these items. Then if the items that make up "sales per cent.," bad debts, insurance, taxes, interest, salesmen's salaries and expenses, and all other items that make up the cost of doing business amount to $200,000, this will be a little over 35 per cent. of the $560,000 to be added to the cost already obtained in order to have made the tool bear its proportion of all the expenses of doing business.

But to give a specific instance, which will perhaps be more valuable than any glittering generalities that I might deal in, I will instance an article which is manufactured by the firm I am connected with and is a familiar farm tool called a "gang plow." It contains 240 separate pieces without counting carriage and machine bolts, nuts, washers, spring cotters, etc., of which items there are about 237 pieces. This tool contains common bar steel, cold rolled steel, soft-center crucible steel, solid crucible steel, spring steel, sheet steel, malleable iron, cast iron, and rock elm or hickory and yellow pine lumber. I estimate that the different number of operations figured on this tool is about 1,000. Before the tool is figured, the contract price and raw material used in it must be ascertained, or if there are any articles not under contract for a reasonable length of time, the market price at the time of figuring.

Then one of the foundation pieces on the tool is taken as a starting point. If this is steel, it is weighed and the actual weight compared with the theoretical weight to see that no great variation occurs; allowances are made for waste so that the gross weight will be charged to the tool; then the operations on this piece are ascertained, and we will suppose that the first one is cutting to length; this will be a piece work operation at so much per 100 pieces, to which must be added a slight percentage for cost of shears. The next operation is presumably the punching operation at so much per 100 holes, with a slight percentage added for punches, or, for the punchman's work on certain class of work, he pays for the punches and dies, the cost of which are in the piece work paid him. From the punch the article goes to the bulldozer or drop hammer, where it is heated and bent or formed. Piece work for this operation is charged against the article, with an additional known percentage for fuel, derived from the actual consumption by the furnace of oil per diem, meter measure. This may leave the piece ready to pass to the mounting department, in which case it is taken by a trucker, who represents non-productive labor, and here comes one of the most difficult items to take care of. The best system we have found for taking care of non-productive labor, is to find the actual percentage per day that non-productive labor in each department bears to productive labor, and add that percentage to the labor on each piece. The percentage of non-productive labor will vary very greatly in different departments. It will also vary greatly according to the amount of work being done in the shop; the greater the output, the lower the percentage of non-productive labor; but in any case it will amount to from 5 to 25 per cent. of the labor in each department. The better the appliances for handling material, the lower will be the amount of non-productive labor.

Without boring you to follow the cost of a tool into too great detail, this piece of material with which we started is followed through every operation until it is delivered to the warehouse, and every other piece of this tool must be treated in the same way. When all the parts of the gang plow have been so treated, their sum will represent what we call shop cost; namely, all the labor and all the material that has entered into them, with the addition of such items as emery wheels, glue, files, drills, taps, etc. Now to ascertain the actual cost of the article shipped, we must add the per cent. before mentioned, namely, "superintendence and power," and on top of this the "sales per cent.," and then the profit we think the tool will stand in the market. The figuring of this tool may involve the figuring of several other fundamental cost items. For instance, cast iron enters into it to a slight extent, and we must



Cross-Section of the Railway Power Plant, Warren, R. I.

know the cost of melted iron, for the molding being piece work, the cost of molding any particular piece may be readily obtained. The cost of melted iron must contain every item of expenditure in the foundry, beginning with the pig iron and the fuel for melting it, and extending even to the clay that daubs the cupola and the fuel that dries the ladles. This operation is simplified in most establishments by the fact that the foundry is run as an independent department, and everything that it uses is charged to it. So, to, with the steel wheels that enter into the tool, they are a product of the wheel department, and are figured as an independent output of that department.

This in a brief and hurried way is the method pursued in establishments of our kind to ascertain the cost of an article in order to fix its selling price and insure profit. The labor involved, though, can be little appreciated from this brief summary. In the first place, the fluctuations of raw materials must be reckoned with. As an illustration, in the last four or five years, the price of melted cast iron, that is cast iron ready to pour into the mold, with all expenses figured except the cost of molding, has varied as much as one-half cent a pound twice in that time, and is now on the way to a third fluctuation that promises to be equally violent. In that time, also, bar steel has gone from 97½ cents to $1.79 per 100 lb. and half way back. Lumber has advanced $8.00 to $10.00 per thousand, and receded from $2.00 to $3.00. All of these fluctuations must be taken into consideration and figured. So, too, every tool is liable to yearly change, and every operation on every piece is liable to change at any time.

I do not feel justified in taking your time to discuss this proposition, the most important question of all outside of strict shop management, namely, the question of what are called overhead charges, or those charges which arise outside of the manufacturing department. These have become in these times as much a percentage of the cost of an article sold directly, or nearly directly to the consumer, that they are, of all things else, the most serious question for manufacturers to consider; for, however good the shop management, methods, and machinery may be, it must be supplemented by equally good management of the items of expense that begin at the office door.

The Tendency from Arts to Engineering.

By William G. Raymond, Professor of Civil Engineering, and Head of the Departments of Engineering, University of Iowa.

It is becoming well known that there has been for a few years last past, in schools of college grade, a very strong tendency away from arts and what has been called general culture and toward applied science, particularly in some one of the branches of engineering. An investigation of the attendance in the several branches at the principal colleges of the country has proved so interesting to the writer, so surprising in the magnitude of the tendency mentioned, that he has thought curves of attendance might prove interesting to engineers generally, as well as to instructors. The curves of attendance are submitted without further comment other than is necessary to explain their meaning, that those who are interested, and desire, may moralize on the tendencies of the times.

Not all colleges that may be called leading colleges are included, because the attendance records for some were not available, and for the period from 1899-1900 to date separate curves have been drawn, including only those colleges for which attendance statistics for the current year were available.

The colleges included in Fig. 1 are the following: University of California, University of Illinois, University of Iowa, University of Kansas, University of Michigan, University of Minnesota, University of Wisconsin, Washington University, Purdue University, Leland Stanford, Jr., Cornell, Harvard, Columbia, Pennsylvania, Lafayette, Lehigh, New York University, and Princeton. Yale was not included because it was not found practicable to distinguish among its scientific students who were engineers and who were in general science. Colleges not offering engineering courses were excluded, as were also those schools offering engineering courses only, or engineering courses and general science only, with the possible exception to this latter rule of Purdue. Under engineering is included only the generally accepted branches of engineering, civil, mechanical, electrical, mining, metallurgical and sanitary.

Fig. 1 includes in the arts courses both men and women, and in the engineering courses only men. If the women were omitted from the courses in arts and general science, the curve of attendance in those subjects would be almost horizontal. Three of the principal colleges do not separate the men and women in their records, and hence a curve pretending to accuracy, including only men, could not be drawn.

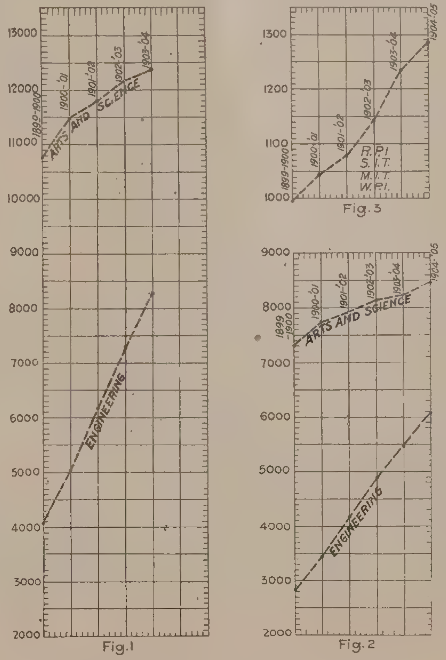


Fig. 1 Fig. 3 Fig. 2

Growth of Engineering and Arts Classes.

In Fig. 2, which includes all those colleges for which records of the current year were available, are the records of the Universities of Iowa, Kansas, Minnesota, Wisconsin, Washington, Purdue, Leland Stanford, Jr., Cornell, Harvard, Columbia, Pennsylvania, Lafayette and New York. The omission of California, Illinois, Michigan and Lehigh, with their large numbers of engineering students, makes the attendance curve in engineering less steep than that of Fig. 1. The colleges omitted have had a particularly remarkable growth in engineering attendance.

In Fig. 3 is shown the record for four leading technical schools, the Massachusetts Institute of Technology, Stevens' Institute, Worcester and Rensselaer. This figure is somewhat unsatisfactory, from the fact that only the three upper classes in the Massachusetts Institute could be included; the registration in the freshman classes were not included in the figures furnished. The Rose Polytechnic Institute was omitted because its attendance is practically constant and equal to the limit that can be accommodated.

From Fig. 1 it will be noted that the attendance in arts and science has increased in four years 15 per cent.; in engineering, 102 per cent.

Only regular students have been included in these statistics.

Tests of Galvanized Iron Plates.

Some tests of plates galvanized by both electrolytic and dipping methods have been made in the laboratory of applied electro-chemistry at the University of Wisconsin, and while the work has not been as thorough and accurate as more elaborate investigations might be made, it has afforded considerable useful engineering data, which Prof. Charles F. Burgess has published in the "Electrochemical and Metallurgical Industry."

The determination of the resistance to corrosion was made by dipping the plates in a solution of two-thirds normal (= 3.2 per cent.) sulphuric acid. Test samples of the galvanized plates, each 2x5 in. in size, were carefully cleaned, weighed and immersed in the solution for definite periods. After being cleaned they were again weighed, and the loss in weight thus determined gave an indication of the rapidity of corrosion. The tests made in this way indicated that electrolytic zinc has better resisting properties than zinc applied in the molten condition.

The adherence was determined by soldering to the zinc surface with a low-melting solder, a copper plug half an inch in diameter. By noting on a spring balance the pull necessary to separate this plug from the iron, a measurement of the adherence of the zinc to the iron is made. It was found that the adherence of the coating deposited from a zinc sulphate solution was 482 lb. per square inch, while that of the coating of hot galvanized plates bought in the local market was 280 lb.

The toughness and strength of the coatings were tested by passing various samples between iron rollers. In some cases the coatings were so brittle as to be cracked off in scales by this treatment, and in other cases the zinc seemed to be pressed into the iron and to preserve a perfectly continuous coating. The electrolytic coatings behaved much better than the hot process coatings when tested in this way. Tests of the coatings made by bending the samples back and forth until the coating cracked failed to show any difference between electrolytic and dipped coatings of equal thickness.

To determine whether there is any relative advantage as regards the resistance to wear, a number of samples of similar size were placed in a tumbling-barrel with quartz sand. The amount of zinc removed after being subjected to the wearing action for several days showed that there is very little difference in the mechanical wearing quality.

One of the disadvantages of galvanized iron is that by rapid heating and cooling the coating becomes non-adherent and separates from the iron in large flakes. A number of tests were made to determine which of the two methods of galvanizing has the advantage in this respect, but the length of time required to make these tests has prevented this question from being definitely determined. It was observed, however, that electrolytic zinc shows a decided tendency to blister on heating, and that this tendency is not manifested in the hot galvanizing. The conclusion drawn by Professor Burgess is that where the material is to be heated the electrolytic zinc is inferior to the older form.

The Steelwork of the Lehigh Valley R. R. Shops at Sayre.

The ground covered by the four buildings of the locomotive repair shops of the Lehigh Valley R. R. at Sayre, Pa., amounts to about 379,000 sq. ft., or nearly 8¾ acres. The main locomotive shop alone covers over 274,000 sq. ft. or 6⅓ acres. The blacksmith shop and store house are each 103x363 ft. and the power house 125x240 ft. The steelwork was designed and the steel construction checked and approved by Mr. D. C. Newman Collins, consulting engineer, New York, under the direct supervision and general approval of Mr. Walter G. Berg, chief engineer, and Mr. E. D. B. Brown, architect, of the railroad company. The details of the shop and field inspection of material were in charge of Mr. F. E. Schall, bridge engineer of the company. It is the intention to limit this article, furnished by Mr. Collins, to the data that governed the design and detailing of the steelwork, and the general description and uses of the structure will, consequently, include only such information as governed the development of this part of the work.

The Main Locomotive Shop at Sayre, Pa.

Main Locomotive Shop.—The diagram shows the symmetrical and uniform layout of the work; the building is of such size that only a part plan and sections are given. They will serve, however, to show the general features of the design. The remainder of the building is a continuation of that shown, with a few modifications that will not prove of any special interest.

The two outside bays have a clear height of 50 ft. to the bottom chord of the trusses and are used for general erecting purposes and for boiler work. The entire central portion of the building, between the erecting shop bays, has a clear uniform height of 34 ft. 4 in. to the under side of the roof girders, which carry a regular system of skylights of the saw-tooth type, having the glass inclined toward the north at an angle of 60 deg. with a horizontal line. The gallery in the center bay has its elevation fixed at 21 ft. 6 in. above the main floor and is intended for the convenient disposal of the heat units, lavatories, lockers and for light storage. This leaves the three center bays with a clear floor for machine shop purposes.

The length of this building is 749 ft., divided into thirty bays or panels of 24 ft. each, and having one half panel at each end of the building which can be removed when future extensions are decided upon; all details and sizes are designed with this in view. The brick walls surrounding the steel frame rest upon their own foundations and are independent of the steel frame except by being anchored to the heavier parts of the posts P1 and being built in between the flanges of the upper section of these posts. The gable walls all run above the finished roof to afford protection against fire and to present a better finish architecturally. All roofs are covered with reinforced cinder concrete, built to provide for expansion and covered with tarred felt roofing and granulated slag.

The two erecting shop bays have a monitor running the full length of the building with pivoted sash on the sides inclined at an angle of 60 deg. with a horizontal line. The vertical sides of the erecting shop, above the saw-tooth portion, are covered with pivoted and fixed sash surrounded by reinforced cinder concrete slabs on steel siding. The gallery floor is of reinforced cinder concrete also. The riveting tower, in the boiler shop section, obtains the necessary clear height by adopting a pit riveter without the necessity for running up the building into an unsightly tower, as is generally done.

Posts P4 and Gallery Framing, Locomotive Shop.

The main posts are left open, for convenient inspection and painting from time to time, except near the floor where they are boxed in with steel plates; these boxes are filled with concrete having the top sloped off at such a pitch as to prevent the possibility of an accumulation of dirt, waste or other inflammable material.

Assumed Loads.—The roof is assumed as weighing 75 lb. per square foot of horizontal projection, which assumption includes the dead weight of material and the weight of snow and wind pressure. The saw-tooth roof is, however, assumed at 85 lb. in view of the probability of large masses of snow accumulating upon it.

Two end trusses in each erecting shop bay are made heavier to permit of lifting the crane crab from the bridge; this assumption was taken at 50,000 lb. concentrated at any point on the bottom chord of the trusses, in addition to the above assumed roof load. All girders under the saw-tooth portion, in line with these special trusses, were also increased in section by an assumed load of 16,000 lb. at any point on the bottom chord for the same purpose. In the south end of one of the erecting shop bays, the regular roof trusses were omitted and heavy box girders of exactly the same profile were substituted; they were designed to carry, in addition to the regular roof load, a special riveting tower crane of 20 tons capacity on a runway provided for it on the side of each girder. This crane has two two-wheel trucks with a maximum load of 32,000 lb. on each wheel and a wheel base of 6 ft.

The gallery load was assumed at 200 lb. per square foot of floor for the live load; the gross load was 240 lb. and special loading and framing introduced for the support of the heat units where required.

The upper craneway in the two erecting shop bays is designed to carry an electric crane of 120 tons capacity for lifting a locomotive bodily over others and lowering it over a pit selected for its repairs. These cranes have two four-wheel trucks with wheels spaced 4 ft. centers, making a total wheel base of 12 ft., and a maximum load of 87,000 lb. on each wheel. The crane rails here used weigh 150 lb. per lineal yard.

The lower cranes in the erecting shop bays, as well as the two 60 ft. span cranes in the machine shop, are of 15 tons capacity having two two-wheel trucks with a wheel base of 10 ft. and an assumed maximum load of 35,000 lb. on each wheel; the 15-ton cranes in each of the 42 ft. bays are like the other 15-ton cranes except the wheel loads which were assumed at 30,000 lb. All rails for the 15-ton cranes were of a weight of 58 lb. per yard.

Working Stresses.—The working stresses of all steel were based on a soft-medium grade with a desired ultimate strength of 60,000 lb. per square inch; tests to be confined within limits of 5,000 lb. above or below this amount. Rivet steel was of a soft grade with a desired ultimate tensile strength of 50,000 lb. The phosphorous limitations were 0.08 per cent. for acid, and 0.04 per cent. for basic manufacture and the sulphur limits were 0.05 per cent. for all grades of soft-medium material. The soft grade of steel was restricted to 0.05 per cent. of phosphorous or sulphur. The specifications also called for the necessary tests and inspection of all material to insure its being of the best quality for the purpose.

The following working stresses were used:

Tension members, 15,000 lb. per square inch.

Compression members, 12,000 lb. reduced by the Rankine-Gordon formula.

Crane girders, 12,000 lb. per square inch of net section.

Rolled beams and channels, 16,000 lb.

Web shear, 9,000 lb.

Shop rivets, 9,000 lb. shear; 18,000 lb. bearing.

Field rivets and bolts, 7,200 lb. shear; 14,400 lb. bearing.

The bearing of steel on concrete was proportioned so as not to exceed 200 lb. per square inch under the most extreme combination of pressures and the concrete bearing on soil not over two tons per square foot under the same conditions.

The stresses due to horizontal wind pressure, for convenience in calculation, were proportioned to the working stresses given above and on a basis of wind at 20 lb. per square foot of vertical projection of surfaces. This is equivalent to an assumption where the extreme possibilities of a uniform pressure of 40 lb. per square foot would not strain the metal beyond the elastic limit. The thrust produced by the action of overhead crane loads was assumed as ample to meet safely all combined requirements. In consideration of the maximum lateral forces, due to the combined action of cranes and wind, being always of a temporary nature, seldom likely to occur simultaneously with the greatest combination of assumed vertical loads for which ample material is provided, this wind assumption seems to be enough to safely meet the most extreme possibilities.

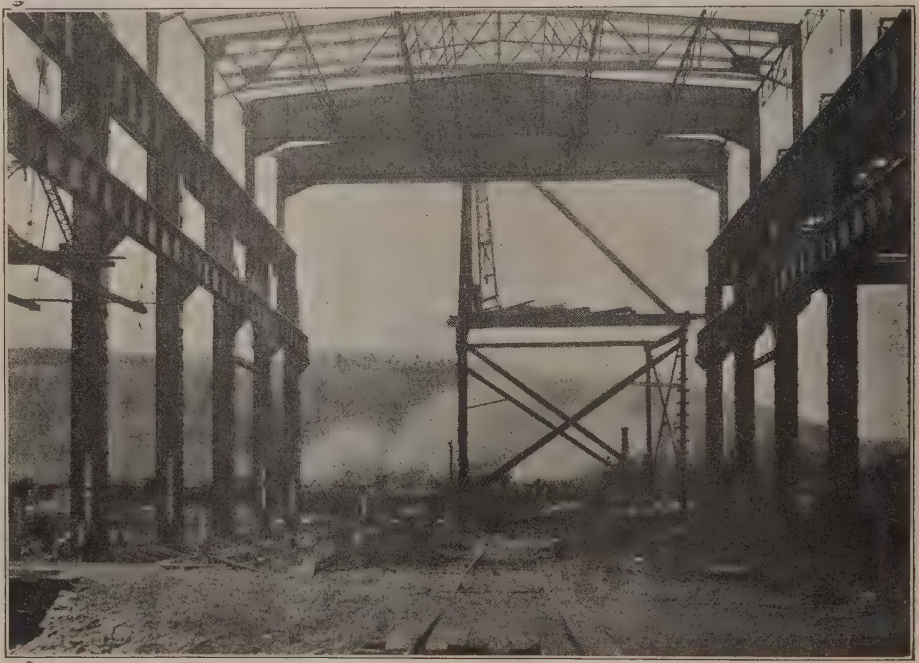
The given value for proportioning the number of field rivets was purposely taken low in order to provide an excess of strength in all connections that were to be riveted at the site. The data given for the detailing of the work and also for the shop fabrication were sufficiently elaborate and clear to control every detail and all shop drawings were thoroughly checked and approved by the company before being sent to the shops.

The Steel Design.—The building was treated in design as a series of craneways, capable of withstanding all lateral pressures and forces, and depending on the lighter roof construction merely as a covering. The main posts were carried below the floor just far enough to bury all obstructions to a clear passageway around them. All posts P1 and P2 were anchored to the concrete piers with four bolts 2½ in. in diameter, and posts P3 and P4 to their respective piers with four bolts 2¼ in. in diameter to each post; this anchorage, together with the sway bracing over the gallery and with the aid of the dead weight of the building itself, is sufficient to withstand the most severe combinations of lateral forces without depending on the brickwork for assistance.

The anchor bolts for all main posts were set in circular metal boxes, 12 in. long and about 4 in. in diameter, to permit a possibility of adjustment of the tops of the anchor bolts after the concrete mass hardens. The posts were leveled up on steel wedges and thoroughly grouted to a solid bearing; 2½-in. holes were punched in all base plates of the posts to facilitate the flow of cement grout and the anchor bolts, by this means, were firmly secured in position.

Expansion of material due to temperature changes was arranged for laterally by designing the top section of all posts P3 in two parts, practically a split post, connected by gussets and slotted holes which allow 2 in. of space for temperature changes in a distance of 78 ft. (from P3 to the center of the building) and 102 ft. (from P3 to the outside of the building). All lateral field connections were riveted except the slotted holes in the top of posts P3.

Longitudinal stiffness and expansion of material were provided for by a series of braced tower bents at every third panel, leaving two unbraced panels between each. At each point between these two unbraced panels all heavy members were specially designed with expansion joints to allow space for 1 in. at each; these were 72 ft. apart. The longitudinal roof members were generally bolted together at the building to avoid the expensive, tedious and unnecessary work of inconvenient riveting; except in the braced panels, where everything was riveted to make the bracing effective. The space allowed for expansion in this light material was assumed as being provided by the accumulated clearances in the many bolted connections.



Riveting Tower Girders, Main Locomotive Shop.

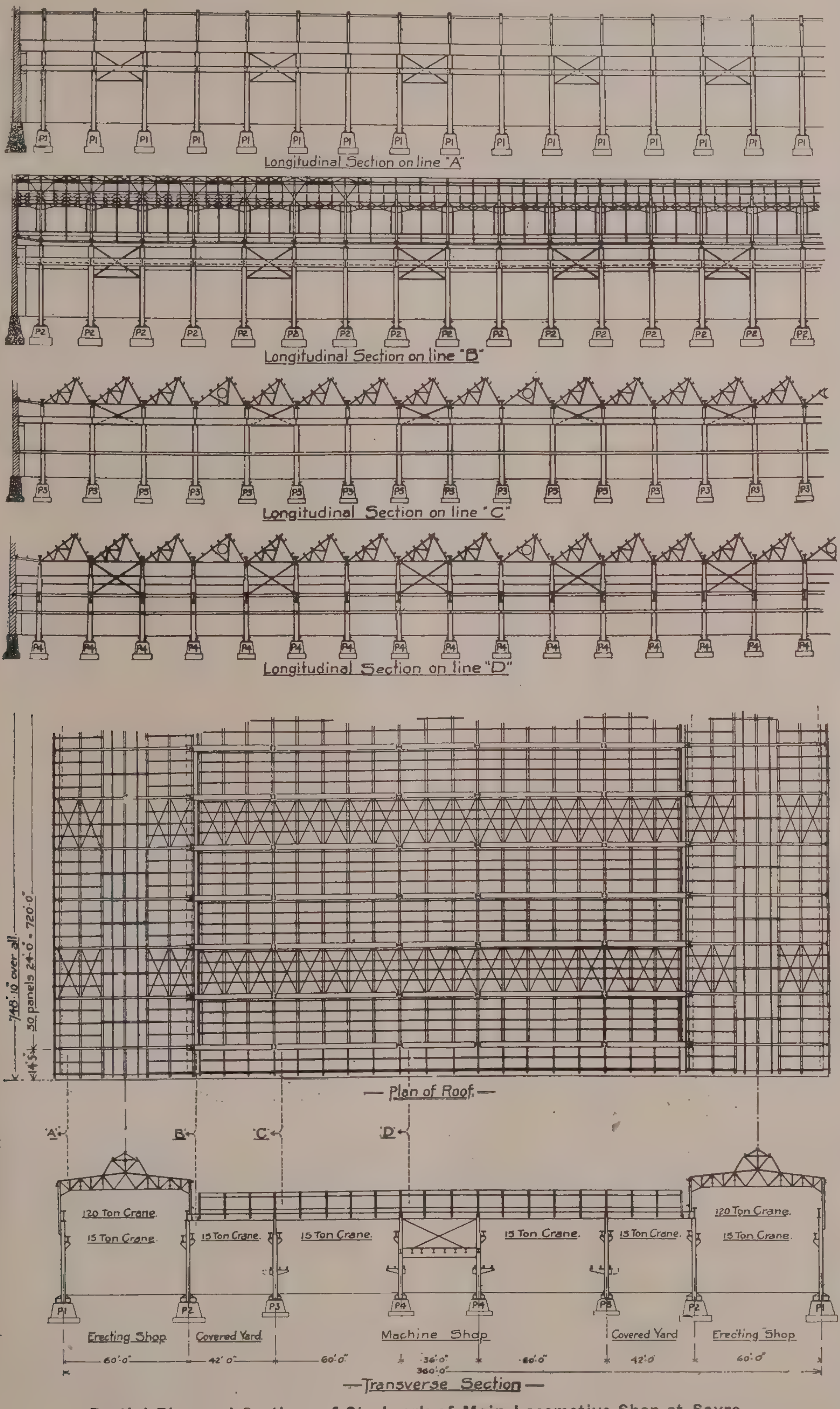
The girders under the saw-tooth trusses, it may be noted, are not made of an economical depth because the additional cost of this shallow limit was warranted by the desirability of getting the skylights as low as possible, both for their own efficiency and for that of the erecting shop windows beside them. Special saw-tooth trusses were placed in five of the panels that came opposite the heat units which were made to allow space for the passage of the large heat pipes; the saw-tooth trusses were 12 ft. apart.

Line Shafts and Motor Brackets.—The original layout provided for continuous line shafts located under the crane girders at posts P3 and also under the center of the gallery girders; three in all. These line shafts are each to be driven by seven motors, so arranged that one motor can drive them and others be coupled in as needed. These crane girders, at post P3, are studied particularly as regards lateral and vertical deflection and are arranged to carry the hangers for support of the main shafts to be secured to wood ties clamped to the bottom flanges of the two girders. The motors are located on steel brackets on the posts about 12 ft. above the floor and assumed as weighing 7,000 lb. each. Brackets for the jack-shafts are placed on all posts P3 and P4, under or near the main shafts, and three longitudinal 12 in. beams are provided on each row of them for the convenient fastening of wood ties to carry the jack-shaft hangers. These jack-shafts are driven by belt from the main shafts and will admit of changes ad libitum in belting to any number of small machines. For convenient adjustment, these brackets were all made in duplicate so that the motor brackets can be located or changed wherever occasion directs.

The erecting shop roof is framed with light angle, trussed, purlins running longitudinally and each well braced from the bottom chord of the roof trusses to prevent vibration. They carry 7 in. channel rafters 6 ft. centers on which the concrete is laid. At the outside eave a 9-in. channel is located both to afford a permanent longitudinal tie and also to provide temporary support for the rafter. The saw-tooth trusses connecting to posts P3 and P4 are made with a bottom chord composed of two 6-in. channels to afford additional tie and bracing to these posts. Four 6x8-ft. loading platforms, or pulpits, are located along the gallery floor, and are designed to carry a live load of 200 lb. per square foot. Framing for the eight flights of circular stairs were provided in the gallery floor framing; also all necessary steel ladders to afford access to the crane cages, to the roof and for cleaning sky-lights. No metal was used in the design of less thickness than ¼ in.

The crane girders were proportioned with liberal width of top chord and were reinforced to better withstand the tendency to lateral deflection due to the action of moving loads. They were carefully arranged to be free from connected bracing so that they are at liberty to deflect vertically with the minimum amount of vibration to the structure. All stiffeners are straight angles on fillers and bear at top and bottom to afford the best support for the wheel loads. These girders are all riveted in solid in all braced bays and have riveted connections even at the expansion points.

Blacksmith Shop.—This building is arranged with the roof trusses in one span of 100 ft. and the trusses are anchored at each end to stone blocks built into the walls. The clear height to the bottom chord of the trusses is 20 ft. No provision for expansion was made in a lateral direction as it was considered safer to require a wall 20 ft. high to accept this duty rather than to expect it to withstand the pushing and pulling of a loose roller bearing that might gradually creep off its support and cause disaster.



Partial Plan and Sections of Steelwork of Main Locomotive Shop at Sayre.

No material was used of less thickness than 5/16 in. on account of corrosion and the bottom chord of the trusses were made stiff and heavy to provide support for the probable concentrations likely to be hung upon them. A monitor with sash, skylights and louvres runs full length of the building and also provides ventilation at the extreme peak by means of an additional small monitor with open louvres. An I-beam trolleyway is located through the building to be equipped with a triplex block and trolley.

No provision is made in the roof framing for the lateral support of the future jib-cranes as their exact location was difficult to determine. Iron blocks were therefore set into the walls under each roof truss bearing which is detailed to provide connections for any future system of rod bracing that may be needed.

The gross roof load was assumed at 80 lb. per square foot. Three panels of rod bracing were introduced in the roof framing to stiffen things generally and all holes necessary for fastening wood, glass and other materials were punched in the steel at the shops before erection.

Storehouse.—This building is divided into two parts, of equal size, by a transverse fire wall. The north half is equipped with transverse hand power cranes of 5 and 15 tons capacity. The roof trusses are designed to carry a gross load of 75 lb. per square foot and the trusses are supported by two rows of posts running longitudinally as well as by the outside walls. A liberal monitor is provided through the center with ample light.

The clear height of the building to the bottom chord of the trusses is 17 ft. above the floor and 21 ft. above the top of the pit rail. Lateral bracing is called for in the roof to counteract the effects of lateral pressures and the action of the cranes.

Power House.—The roof trusses here rest upon, and are anchored to, the brick walls at the sides of the building as well as to the center longitudinal fire wall. They are designed to carry a gross load of 85 lb. per square foot in addition to 2,000 lb. concentrated at any point on the bottom chord. The boiler house trusses have in addition to this a load of 4,000 lb. on the bottom chord at the center as the assumed weight of a coal conveyor.

A monitor with sash on two sides and two separate rows of skylights are introduced over the boiler house; portions of the skylights are movable for the convenient removal of upright boiler tubes. The engine house has one row of skylights. One 20 ton crane with two two-wheel trucks is located here. The wheel base is 10 ft. and the assumed load on each wheel 38,000 lb.

The engine house floor is calculated to carry a live load of 400 lb. per square foot in addition to the weight of the floor material. Grillage is included for the support of boilers and tunnels over the smoke flues and also for the support of the coal pockets which have posts located over the flues or tunnels.

Two steel coal pockets are built in the boiler house with a capacity of 260 tons each. They have hopper bottoms and are plate lined. The ash bins and coal conveying tower is of steel and has a reinforced cinder concrete roof covered with tarred felt and granulated slag. The sides are covered with corrugated, galvanized iron. Each of the two ash bins have a capacity of 3,000 cu. ft. and are lined with reinforced cinder concrete. This tower also includes supports and facilities for fastening all coal conveyors, ash hoists and for the convenient loading and unloading and crushing of coal.

The roof of each building in this group has the same covering of reinforced cinder concrete covered with tarred felt and granulated slag. All holes were carefully incorporated in the original design for the fastening of the work of other trades so that they could be punched at the shops rather than have to undergo the tedious and expensive process of drilling in the field. All stresses and sizes of material were carefully and fully shown on the plans side by side to facilitate the ready completion of the work; all governing sizes of members and of connections were thoroughly fixed at the start for the use of the various trades; all details of the shop work were promptly checked and approved to avoid delay. The work was then quickly, accurately and satisfactorily executed in the shops of the American Bridge Co.

Removal of Snow from City Streets.

By Leicester Allen.

With the growth of numerous large cities in a country liable, like many parts of the United States, to heavy snowfall, the removal of snow from city streets has become a problem of first magnitude in municipal engineering. The old time shoveling, horse-and-cart system, no longer meets the emergency. Were it a case of merely opening paths, shoveling alone would answer; but nothing short of complete, rapid removal of snow from city streets which require absolute freedom from obstruction to satisfy all the needs of public traffic can now be considered.

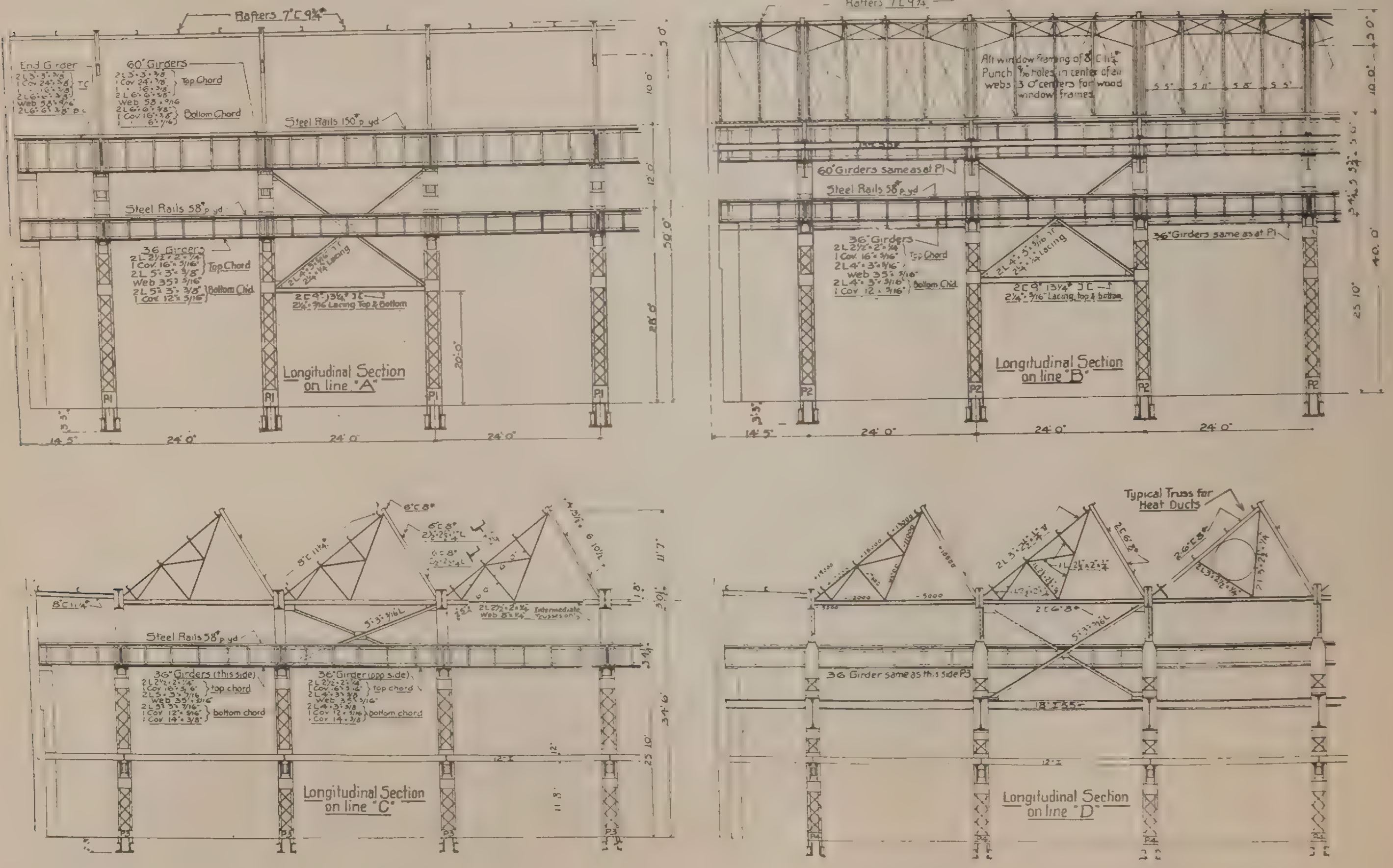
On Dec. 28 of the present winter, it was stated in a prominent New York daily newspaper that, up to that date, the removal of snow had already cost the city of New York one million dollars. Since that date and before Jan. 10, heavy snowfalls compelled the expenditure of probably as much more, so that, if the above statement was correct, it is safe to estimate the cost of this kind of work up to the last named date as two millions, with half of the usual winter season yet to come.

The removal of dirt and the sprinkling of streets to allay dust have engaged the attention of engineers and inventors to the point of introducing improved, effective and economical appliances and methods; but the system of snow removal has not shared general advancement and remains precisely as it was a century ago. Does the problem present such difficulties as to be wholly incapable of solution? It may be profitable to consider the inherent possibilities of attaining a better system.

The amount actually expended in shoveling and carting away snow is only one of the items of loss. Such a city as New York suffers heavy loss by undue delay in removing snow. The partial interruption of business, injury to animals and increased wear and tear of vehicles used in transportation of goods and passengers, probably nets an equal money loss; while the risks to life and health, and the great inconveniences entailed upon citizens are items which cannot be made subjects of financial estimate. Five millions of dollars would be a cheap price to pay for summary and thorough removal of snow from New York City streets during such a winter as that of 1904-05.

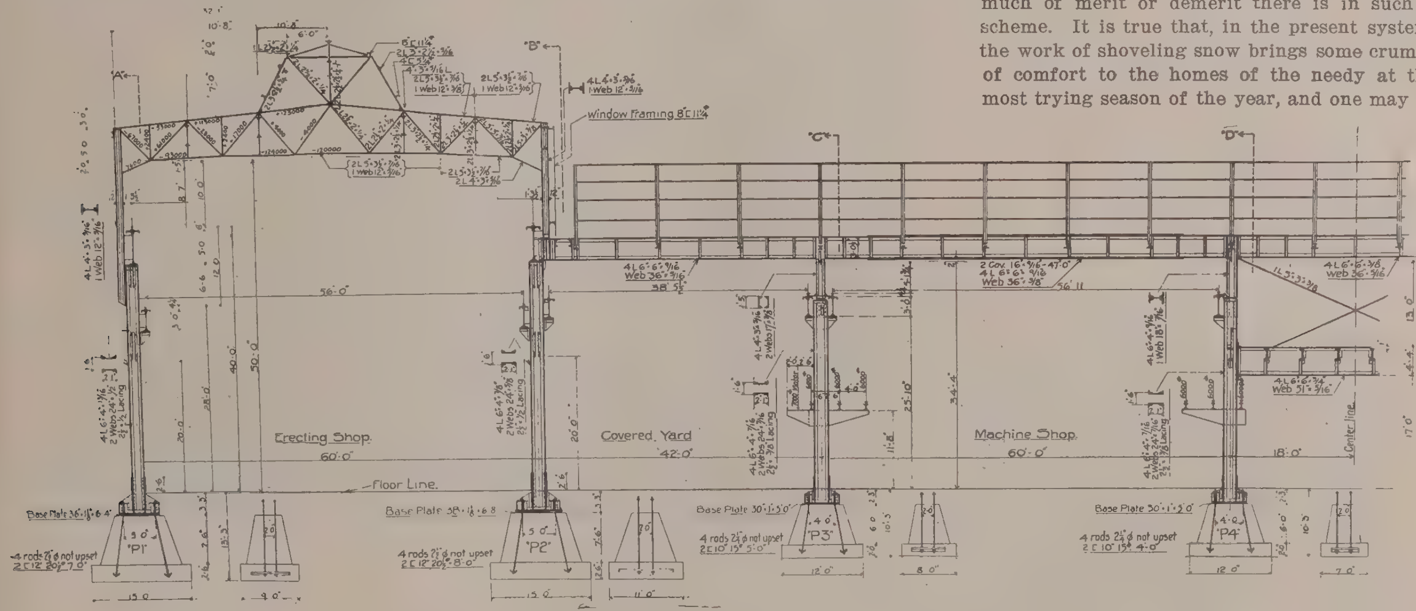
At intervals during the last half century the suggestion has been made that a portable steam snow-melter might be used as a substitute for shoveling and carting. The densest dry snow falling in the latitude of New York, according to a series of experiments made by the writer, weighs 21 lb. to the cubic foot, neglecting a small fraction. This snow was almost like finely pounded ice, or was, more properly, sleet—solid ice crystals—perhaps mingled with some softer snow. Fine, feathery snow is often very light, a cubic foot sometimes weighing not more than 7½ lb. The average of the experiments referred to has given a mean weight of 8.73 lb. Trautwine gives the weight of dry, new fallen, snow as from 5 to 12 lb. per cubic foot. The heavier the snow the more cheaply a specified weight of it can be removed in the present mode, because men can shovel, and carts can carry, greater weights than they can of light snow. Bulky, light snow often costs more for removal, weight for weight, than heavier snow of less depth. It does not seem improbable that some method will be able to dispense, partly, at least, with shovels. Even if it can be shown that steam snow melters are feasible, the snow must first be got into the melters. It is true that snow can, without shoveling, be melted on the ground by direct jets of steam blown into the accumulations, but very little consideration will convince anyone of the utter impracticability of such a scheme. It would be attended with great waste of steam into the air without expending its heat upon the snow, and the melted snow water, congealing upon the surface of the cold pavement, would soon convert the streets into skating rinks.

Taking the average of snow weight already named as a basis of computation, and an average temperature during its removal as 20° Fahr., discharging the water at say 40° Fahr. or at a temperature which will keep it from freezing before running it into the sewer, and assuming the specific heat of snow to be the same as that of ice, 52.8 B.t.u., will bring one cubic foot to the melting point, 1243.152 units more will melt it, and 71.84 units more will bring it to the assumed temperature of discharge, or a total of 1367.792 B.t.u. will be needed. Assuming steam at 60 lb. gauge pressure to be carried in the boiler, such a pressure having to be maintained for purposes of propulsion, one pound of steam in condensing and cooling down to 40° Fahr. would yield 1105.055 B.t.u., and 1.2369 lb. of steam will melt and discharge at 40° Fahr. a cubic foot of snow of average density. Favorable conditions for economical steam production in an apparatus of this nature cannot be expected, and in the absence of experience, we may assume that it would not exceed about 6.5 lb. per pound of anthracite burned. On this basis 5.255 cu. ft. of snow could be melted, and run into the sewer for every pound of anthracite burned. Now, assuming the average price of coal to be $4 per ton of 2,000 lb., we can remove 10,510 cu. ft. of snow at a cost of $4 for fuel. By heaping, an ordinary one-horse cart can perhaps convey 120 cu. ft. of snow, and, as a moderate estimate, the average distance of carting to find dumpage at river piers or vacant lots can not be less than half a mile, nor the average time for a trip less than 25 minutes, or


Rafters 7" C 9¾#
End Girder
60" Girders
Top Chord
Bottom Chord
Steel Rails 150# p yd
Steel Rails 58# p yd
36" Girders
Longitudinal Section on line "A"
P1
14' 5"
24' 0"
Rafters 7" C 9¾#
All window framing of 8" C 11¼#. Punch 9/16 holes in center of all webs 3' 0" centers for wood window frames
60" Girders same as at P1
36" Girders same as at P1
Longitudinal Section on line "B"
P2
Steel Rails 58# p yd
36" Girders (this side)
36" Girder (opp side)
top chord
bottom chord
Intermediate Trusses only
Longitudinal Section on line "C"
P3
Typical Truss for Heat Ducts
36 Girder same as this side P3
Longitudinal Section on line "D"
P4

Typical Framing Systems on Axes Indicated on Plan and Transverse Section of Lehigh Shop.

about 24 loads per working day. Supposing it to cost for cart and driver $3 per day; it then costs $3 for the carting, alone, of 2,880 cu. ft. of snow, at which rate, the 10,510 cu. ft. that can be melted for $4, would cost for cartage, $10.94. It is not to be supposed that these figures are more than a sufficiently close approximation to show the marked economy of snow melting as compared with snow carting. If, in addition to this, snow shoveling, or the greater part of it, could be got rid of without extra expenditure for fuel, a still greater gain in economy would result. And if a steam operated device for gathering the snow and getting it into the melter could be used, we might have a portable condensing engine working with no cost whatever for fuel, since its exhaust steam would be practically just as available for snow melting as the high pressure steam used for driving the apparatus.


"A"
"B"
"C"
"D"
8[11¼
2L 3·2½·5/16
4[5¼
4·3·5/16 L
2L 5·3½·7/16 1 Web 12·3/8
2L 5·3½·7/16 1 Web 12·3/16
4L 4·3·5/16 1 Web 12·5/16
Window Framing 8[11¼
2L 5·3½·7/16 1 Web 12·5/16
2L 5·3½·7/16
2L 4·3·5/16
4L 4·3·5/16 1 Web 12·5/16
56'·0"
4L 6·6·9/16 Web 36·9/16
38' 5½
2 Cov. 16·9/16 - 47'·0"
4L 6·6·9/16 Web 36·3/8
56' 11
4L 6·6·3/8 Web 36·5/16
1L 3·3·3/8
4L 6·6·3/4 Web 51·5/16
4L 4·3½·5/16 2 Webs 17·3/8
4L 6·4·9/16 1 Web 18·7/16
4L 6·4·7/16 2 Webs 24·1/2 2½·½ Lacing
4L 6·4·7/8 2 Webs 24·3/8 2½·½ Lacing
4L 6·4·7/16 2 Webs 24·7/16 2½·3/8 Lacing
Erecting Shop.
60'·0"
Covered Yard
42'·0"
Machine Shop.
60'·0"
18'·0"
Center line
Floor Line.
Base Plate 36·1⅛·6·4
Base Plate 38·1⅛·6·8
Base Plate 30·1·5'0"
Base Plate 30·1·5'0"
4 rods 2¼ ϕ not upset 2[12" 20½ 7'0"
4 rods 2¼ ϕ not upset 2[12" 20½ 8'·0"
4 rods 2¼ ϕ not upset 2[10" 15 5'·0"
4 rods 2¼ ϕ not upset 2[10" 15 4'·0"
"P1"
"P2"
"P3"
"P4"

Typical Cross-Section of Main Locomotive Shop, Lehigh Valley R. R.

Somewhere between 1867 and 1872, a curious machine appeared on one of the short streets below Chambers St., New York, between Broadway and North River, attracting much attention to its operation. This machine was employed for heating stone used in laying a newly patented concrete pavement. The stone, crushed into small pieces of irregular form, was heated and dried by this machine and was rolled down to a smooth surface in hot patented cement. The broken stone was required to be hot and dry to secure the desired adhesion of the cement. The pavement proved a failure, but the heating and drying of the stone was a very successful and economical operation, using much less fuel than had previously been required for the same purpose. A strong shell of boiler iron, with an opening through which the broken stone could be shoveled into it, was mounted on wheels, together with an upright steel boiler, a steam engine, and mechanism for propeling the whole apparatus over any street surface, making the machine a strong, but not swift, automobile. When the shell was charged with, say, two tons or more of the broken stone, the opening through which the stone was shoveled was closed steam tight, by a hinged cover. Live steam of about sixty pounds gauge pressure was then passed from the boiler directly into the shell, which was also provided with automatic drainage for escape of the water condensed by contact with the cold broken stones which, of course, presented a great extent of condensing surface. The road metal was thus heated very rapidly to the temperature of the steam in the boiler, this temperature being announced by the escape of high pressure steam from the automatic draining device. The machine was then propelled by its engine to the point where the material was needed and the shell being turned into an inclined position the broken stone was promptly discharged.

This machine may be viewed as a hint toward the designing of a snow-melter. Let us suppose a similarly propelled machine with powerful sweeping devices that should carry the snow on to a conveyor which should in turn carry the snow into one or other of two melting chambers of boiler iron, each capable of holding, says, 480 cu. ft. While one cylinder is filling, the snow in the other is melting. The steam should enter these melting cylinders at many different points for as uniform distribution as possible, and it is believed that this could be done in such manner that the melting could easily be performed in the time required for filling one of the tanks by the automatic snow gathering apparatus. The work could then proceed continuously. The water might be discharged directly into the sewer openings at street corners, or, after first shoveling one of the gutters clear, it could be allowed to flow through this channel into the sewer, as at the assumed temperature of discharge it could not freeze while flowing the length of a city block.

Suppose such a machine to have grate surface capable of consuming, with or without forced draft, one ton of anthracite per hour. We have seen that this would effect the removal of 10,510 cu. ft. of snow of average density; in 24 hours it would remove 252,240 cu. ft. The average depth of snowfall, say in the city of New York, cannot be more than 6 in. A snowfall of 1 ft. in depth is exceptional; it does not occur once a year. We will assume for further calculation a snowfall of average density and a depth of 6 in. We will also assume a street of 100 ft. wide, inclusive of sidewalks. There would be deposited on one mile of such a street, upon these assumptions, 264,000 cu. ft. Our machine would therefore practically be able to clean nearly an entire mile of such a street from snow in 24 hours; but, as it could not be permitted on the sidewalks, these would still have to be cleaned by the use of shovels and brooms. No carting would be needed. Such machines could be started in a very short time after a severe snowstorm should set in, and kept going. If the snowfall should begin, say, at six o'clock in the morning, the machine could be set at work in say an hour's time. One hundred of them so set at work on the main streets would by the next morning have nearly 100 miles of highway entirely clear, and would have kept them substantially clear while working. By the present method it would be, perhaps a week before such a result could be expected, and, during all this period, obstruction to traffic and serious interruption to business must be suffered, as well as during the progress of the storm.

Of course, the cost of fuel is only one item, but it has been shown that this is very much less than the cost of carting. The shoveling, confined to sidewalks, would cost less than half per mile of streets than it now costs. Against these savings would be offset the interest on the cost of the machines, their annual deterioration, the wages of the men employed to operate them, and the rental of a place for their storage when not in use. It would be mere guesswork to attempt an estimate of the cost of building a machine of the general character herein suggested; but it certainly seems that the engineering possibilities outlined might justify a large municipality in setting a competent engineer at the work of finding out how much of merit or demerit there is in such a scheme. It is true that, in the present system, the work of shoveling snow brings some crumbs of comfort to the homes of the needy at the most trying season of the year, and one may be pardoned for shrinking from any scheme calculated to cut off any of their resources; but the history of industrial innovations proves that the condition of the common laborer has been improved rather than injured by mechanical progress.

THE FAILURE OF STEAM VALVES of cast iron was discussed recently at some length in "Le Genie Civil" by Mr. Sylvain Perisse, who gave an account of an accident which happened in an electric station in Paris. The valve in question was 12.6 in. from the top of a 6.3-in. vertical pipe, which was joined at the upper end into a horizontal main steam pipe 11.8 in. in diameter. Drain cocks were provided in the main pipe, but there was sufficient space above the valve to hold 1.43 gal. of water. When the accident happened the valve had been closed for eight hours and although the valve was opened very gradually, rupture ensued. In explanation of the failure, it was argued that the cause might be traced to the liberation of energy by the rapid expansion allowed on opening the valve. The author's conclusion was that a small by-pass should be fitted to all valves on a vertical or an inclined steam pipe.

Sewage Disposal at Saratoga Springs, N. Y.

The sewage disposal system at Saratoga Springs is one of the most interesting in the country, not only on account of general features of the works themselves, but also from the peculiar conditions governing their design. The permanent population is about 12,000, but during the summer the visitors to this famous resort raise the average population to 30,000, with a maximum of 50,000. The problem of disposal, therefore, was to plan works for a city of 40,000 people which would be equally serviceable during a large part of the year for a village of a quarter of that number of persons. The transient population is largely made up of wealthy people accustomed to a lavish use of water, which had to be considered in designing both water and sewerage works.

The main part of the town lies on the southeastern slope of a spur of the Adirondack Mountains. The remaining portion is separated from it by the head of a valley of a small stream and spreads out over a sandy plain. The original sewerage system was on the combined plan and had its outfall about 6 miles below the built-up part of the town, where the dry-weather flow was discharged, without purification, into a creek. An overflow was provided about 5 miles above the outfall, and the storm water discharged at this point into a smaller creek. Nuisance was held by court decisions to be committed at both discharging points, and a purification plant has accordingly been installed to prevent further trouble. Prior to the building of the disposal plant new surface water drains were constructed and the old pipes of the combined system retained to serve as sanitary sewers. The work was planned by Mr. F. A. Barbour, of the firm of Snow & Barbour, Boston, and the following facts concerning it are taken from a paper read by him before the Sanitary Section of the Boston Society of Civil Engineers.

Measurements made by a weir in the main outfall sewer at the storm overflow showed the maximum flow at that point to be about 2,700,000 gal. per 24 hours. But it was known that this included a large amount of water from springs, which would be excluded if a new main were constructed. An estimate of the amount of this inflow was made by measuring, with a specially devised form of Pitot tube, the flow in the main sewer at frequent intervals of its length, and of the flow in the laterals tributary to it.

The Pitot tube consisted of two brass tubes with elbows at the bottom, one pointing upstream and one downstream, with gauge glasses inserted in them, as shown in the illustration. Both tubes were firmly attached to a collar which could be moved up and down on a vertical standard and fastened at any elevation by a set screw. Each brass tube had a stop cock just above the elbow, and these cocks were opened and closed by geared pinions through the movement of a double-faced rack. By placing the standard on the invert of the sewer and lowering the collar until the mouth of the tube was at the proper level, then opening the stop cocks and, after an interval, closing them, the liquid would be caught in the two tubes. The apparatus could then be lifted up to read the difference of level in the two gauges, and the velocity of flow determined from the readings. Where the depth of sewage was very small, a partial vacuum could be created in the tubes by a rubber bulb, and the liquid made to rise so as to be readable in the glass gauges. The instrument was calibrated by comparing the discharge as determined by it with that given by a weir. It was found that the velocity as shown by the tube had to be multiplied by 0.67 to give correct results. The velocity as given by floats in a 36-in. sewer flowing one-third full had to be multiplied by 0.75 to agree with weir measurements. The tube was not considered by Mr. Barbour as an accurate gauging device, but gave results sufficiently reliable for the purpose.

From the information gathered from these gaugings it was estimated that, if a new main sewer were constructed, the flow of sewage would range from 1,500,000 gal. to 1,700,000 gal. per 24 hours, except during the summer months, when it would increase to a maximum of 2,500,000 gal. per 24 hours. The design of the plant was based on these quantities.

The new main sewer, as proposed, reached the edge of the town at an elevation which made it almost possible to build a disposal plant at a point where a gravity flow could be utilized. The material here, however, was not suitable for contact or filtration bed construction, so it was concluded to elevate the sewage to a higher territory where more favorable material was found. The land in this higher territory was composed of 8 in. of loam on top, 2 ft. of subsoil, beneath which was sand averaging about 0.22 mm. in effective size, with a uniformity coefficient of about 2.0. Borings sunk to a depth of 16 ft. below the surface did not reach the bottom of the sand, and showed that the normal ground-water plane was at least that far below the surface. Furthermore, the site was well adapted to the location of a disposal plant by reason of its topography and seclusion, so it was concluded to pump the sewage and utilize this area for slow sand filtration beds in connection with septic tanks.

Intermittent Sand Filtration Beds at Saratoga Springs.

The improvements as proposed included the construction of a new main sewer, the building of a small pump well and pumping station at the end of this main, the installation of electrically-driven centrifugal pumps for lifting the sewage 15 ft., the laying of a force main about 9,000 ft. long, from the pump well to four new septic tanks, with a capacity of 1,000,000 gal., and the construction of 18 acres of sand-filter beds.

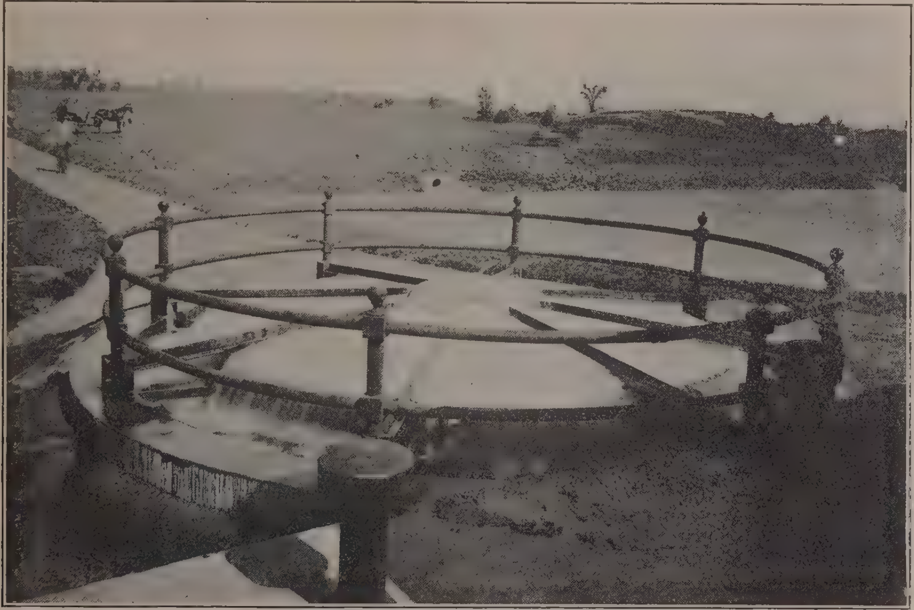
The pumping station comprises a pump well of 16,000 gal. capacity, and a small brick building built over it. The pumping machinery consists of three submerged 6-in. centrifugal pumps resting on I-beams about 30 in. above the bottom of the pump well, each direct-connected by a vertical shaft to a 20-kw. electric motor in the building over them. The 24½x12-ft. pump well is built of concrete mixed in the proportion of 1 part cement, 3 parts sand, and 5 parts crushed rock, and has its bottom 10 ft. below the invert of the main sewer. The sewage passes through a screen and falls into a narrow chamber and then flows to one or more of the three pump pits in which the well is divided, and any one of which may be shut off by closing a gate. The screen is a counterbalanced cage, which is raised and lowered by a chain and sprocket wheel actuating a worm gearing, with a ratchet to hold the cage at any desired height. The cage, when full, is elevated above the ground floor, and its contents dumped in a wheelbarrow. A toothed comb lifts as the cage is raised and temporarily prevents large solids from reaching the pumps. The ¾-in. rods used in making the screen were spaced 1¾ in. on centers, but this was found not to be close enough to remove solids which would interfere with the operation of the 6-in. pumps, and a screen of closer mesh was placed inside the cage.

Continuous pumping at a uniform rate would have required an equalizing reservoir larger than it was considered economical to construct, so a rate of pumping approximating the rate of flow in the gravity sewer was adopted. The total pumping capacity is divided into three units, each capable of elevating about 1,000 gal. per minute, when operating at 765 to 785 r.p.m. and against the head developed at the time all three are in service. Two of them are intended to take care of the maximum flow and the third is held in reserve. Each pump has an 8-in. suction and an 8-in. discharge pipe, with a check and straightway valve in each branch discharge. A valve is also placed in the short length of suction pipe below each pump, by which the suction may be throttled when the inflow of sewage is less than the capacity of one pump.

The pump motors are started and stopped by switches in the motor room, which are automatically controlled by floats on the surface of the water in the pump well. The floats are so arranged that one motor is started when the sewage reaches a depth which is about the capacity of one pump, the second at a depth of about 2 ft. more, and the reserve unit is thrown in service when the depth becomes 4 ft. greater than that required to start the first motor. The units are interchangeable in their time of being started, and the pumping capacity is as nearly adapted to the flow as is practicable.

The vertical shaft connecting each pump to a motor in the room above is guided by two sets of I-beams. A slip coupling is placed in each shaft just below the floor, in order that the weight of the motor and its shaft may be carried by the motor bearing and that of the pump shaft, and the thrust of the impeller by a thrust bearing set on the higher pair of I-beams guiding the shaft. The motors are vertical six-pole 20-kw. induction machines, with a rotary field, using three-phase current at 40 cycles frequency. The power is obtained from the power house of the Hudson River Power Co., and is delivered at a primary pressure of 2,300 volts, and stepped down to 220 volts by transformers on the outside rear wall of the station building. The average combined efficiency of the pumps and motors is about 35 per cent.

The automatic starting and stopping apparatus is entirely satisfactory in its operation, but the switches, although submerged in oil, require more or less attention to insure freedom from imperfect contacts and consequent burning out of the motors. This posibility has been avoided to an extent by installing time relays which, on the motor failing to start or becoming plugged with solid matter, automatically shut off the curent.

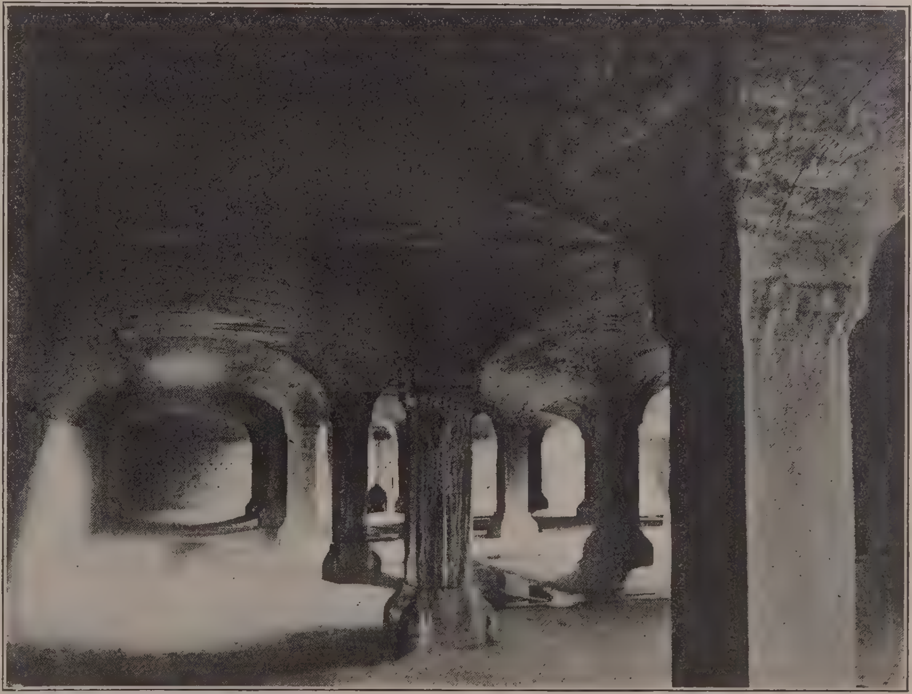


Aerator on the Discharge Pipe of the Saratoga Springs Septic Tanks.

The station building is 20x25 ft., inside, with an 8x10-ft. addition at the rear, in which the screen hoist is operated. The building is placed directly over the pump well, but there is no connection between the motor room and the well, as the entrance to the latter is obtained through the screen room. The pumping plant was installed by R. D. Wood & Co., Philadelphia, at a cost of $5,400. The building cost $2,000, and the pump well about $2,000.

The force main from the station to the septic tanks is 16 in. in diameter and 8,835 ft. long. It is laid level or with an ascending grade to a point 4,400 ft. from the station, where a 4-in. air vent is placed. From this point it descends to the crossing of a water course, where a blow-off was introduced, and that it rises continuously to the tanks. It may be drained either to the station or to the blow-off, and was laid in cuttings or in embankments which are 6 ft. wide at the bottom and top, respectively.

The septic tanks have a total capacity of 1,000,000 gal., divided into four units, each 91½ ft. long by 51½ ft. wide, and separated from the adjoining tank by a division wall. High water in them is 18 ft. above the lowest elevation in the pump well at which the first pump is automatically started, but the total head is considerably in excess of that amount. The depth of sewage at the inlet end is 7¾ ft., and at the outlet end 8¼ ft. The tanks are covered by an elliptical groined-arch roof, supported on piers and the walls, and over it is an 18-in. covering of earth. The entire structure is of Portland cement concrete. The outside walls are 2 ft. thick at the springing line of the arches, vertical on the inside, and with a batter of about 1⅓ in. to the foot on the outside. The division walls are 2 ft. thick at the springing line of the arches and 3 ft. thick at at the underside of the floor. The roof arches have a span of 11½ ft., a rise 2½ ft., and a thickness at the crown of 6 in. The plane of the extrados is depressed 9 in. over the piers, and the depression drained into the tank by a 2-in. tile through the roof. The piers are 18 in. square. Their heads are enlarged to 22-in. square and their footings to 30 in. square. The floor is of inverted groined-arch construction, 6 in. thick at the center and 12 in. thick at the piers.



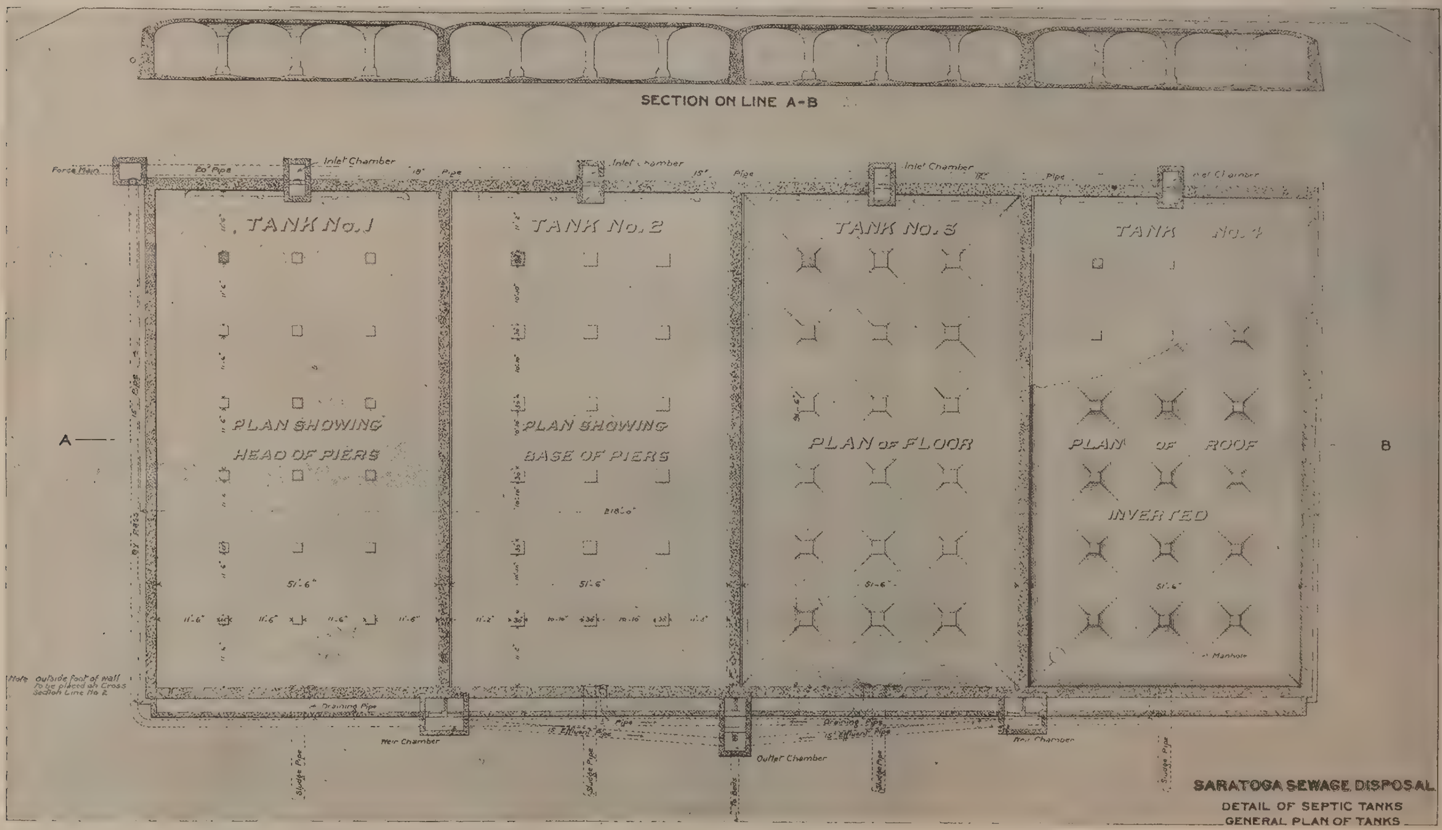
Interior View of Septic Tank Looking Toward Outlet End.

The force main ends in a chamber from which a vitrified pipe is carried across the inlet end of the tanks on a concrete bracket reinforced by old railroad iron. Inlet chambers permit the shutting off of any of the tanks. Inside of each tank the vitrified pipe inlet divides at the center and extends both ways across the end of the tank. Four tee joints are introduced in it and provide openings for admitting the sewage to the tanks at an elevation 3½ ft. below the high water line. The septic effluent is discharged at the opposite end through ninety-six 2-in. pipes, in two horizontal rows, also 3½ ft. below the high-water line, in a narrow chamber extending the width of the tank. From this chamber it flows over a weir into an outlet chamber, and thence through an aerator to an adjacent dosing tank.

At the junction of the narrow transverse chambers at the end of the tanks a weir gate is placed through which the effluent can be turned from any tank to an adjacent one for storage, in case it is desired to apply the liquid to the filter beds only during the day at the time of extremely low temperature. A 24-in. gate permits the emptying of the sludge on sludge beds directly in front of the tanks, and 12-in. gates at a higher elevation make it possible to draw off the clear liquid between the scum and the deposit and apply it to any bed previous to the discharge of the sludge. All gate stems are carried through the roof in specially threaded nuts, so as to protect their working surfaces from corrision by the sewage. Six 3-ft. manholes are built in the roof of each tank. A by-pass from the inlet chamber at the end of the force main leads around the tanks and permits the raw sewage to be applied directly to the beds.

The walls of the tanks were constructed first and the floor afterward laid by placing the alternate groins with wooden template on the diagonals and then filling in between the concrete already laid. The side forms were built of 2x4-in. vertical studding, on 18-in. centers, and 1-in. planks. Centers for the roof were provided for two tanks and used twice. The ribs were separately erected each time, no attempt being made to move the centers in sections.

A mixture of 1 part of cement, 2½ to 3 parts of sand, and 5 parts of stone, depending on the percentage of voids, was used in the concrete. In the roof an endeavor was made to limit the stone to 1½ in. in diameter; in the side walls and floors stone up to 2½ in. in diameter were used. The quantity of cement slightly exceeded 1¼ bbl. per cubic yard. The concrete was made quite wet and mixed by hand. The sand and cement were mixed dry, then water was added and the mortar well mixed. The stone was then dumped in and the concrete turned twice. The placing was practically a continuous operation, and, although relatively little tamping was done, the surfaces were smooth as they came from the forms. The forming and centering, including that for chambers, outlets, piers, brackets, roof, walls and floor, cost a little more than $1.50 per cubic yard of concrete. The cost of mixing and placing was about 85 cents per cubic yard and the total cost, figuring stone at $1.25 per cubic yard, amounted to about $7 per cubic yard of concrete.



General Plan of the Septic Tanks of the Saratoga Springs Sewage Disposal Plant.

The aerator to which the effluent from the tanks flows through a tee on the 16-in. cast-iron pipe outlet from the tanks to the filters, is made of sheet-iron plates hung in three layers around a central riser pipe. The liquid rises through the central pipe and flows over the plates in a thin sheet, and thence to the dosing tank. The percentage of dissolved oxygen in the sewage at different points in its passage through the works is given in the accompanying table. While the actual value of the aeration of the septic effluent has not been determined, no difficulty has been experienced in effecting the nitrification of the septic effluent on the filters.

Percentage of the Oxygen Saturation of the Sewage in Different Parts of the Works.

Sewage entering the tanks	4.3%
Effluent before aeration	0.0%
Effluent immediately after aeration	70.4%
Effluent as applied to the filters	40.4%

The aerator is set in a circular well of concrete adjoining the dosing tank, near the center of the filtration area, and may be cut out of operation by opening a gate at the end of the 16-in. outlet pipe and admitting the liquid directly to the dosing tank. The combined capacity of the concrete chamber enclosing the aerator and the dosing tank is 26,000 gal. The tank is octagonal in plan, with 12-in. walls and a roof of I-beams and a 6-in. reinforced concrete slab.

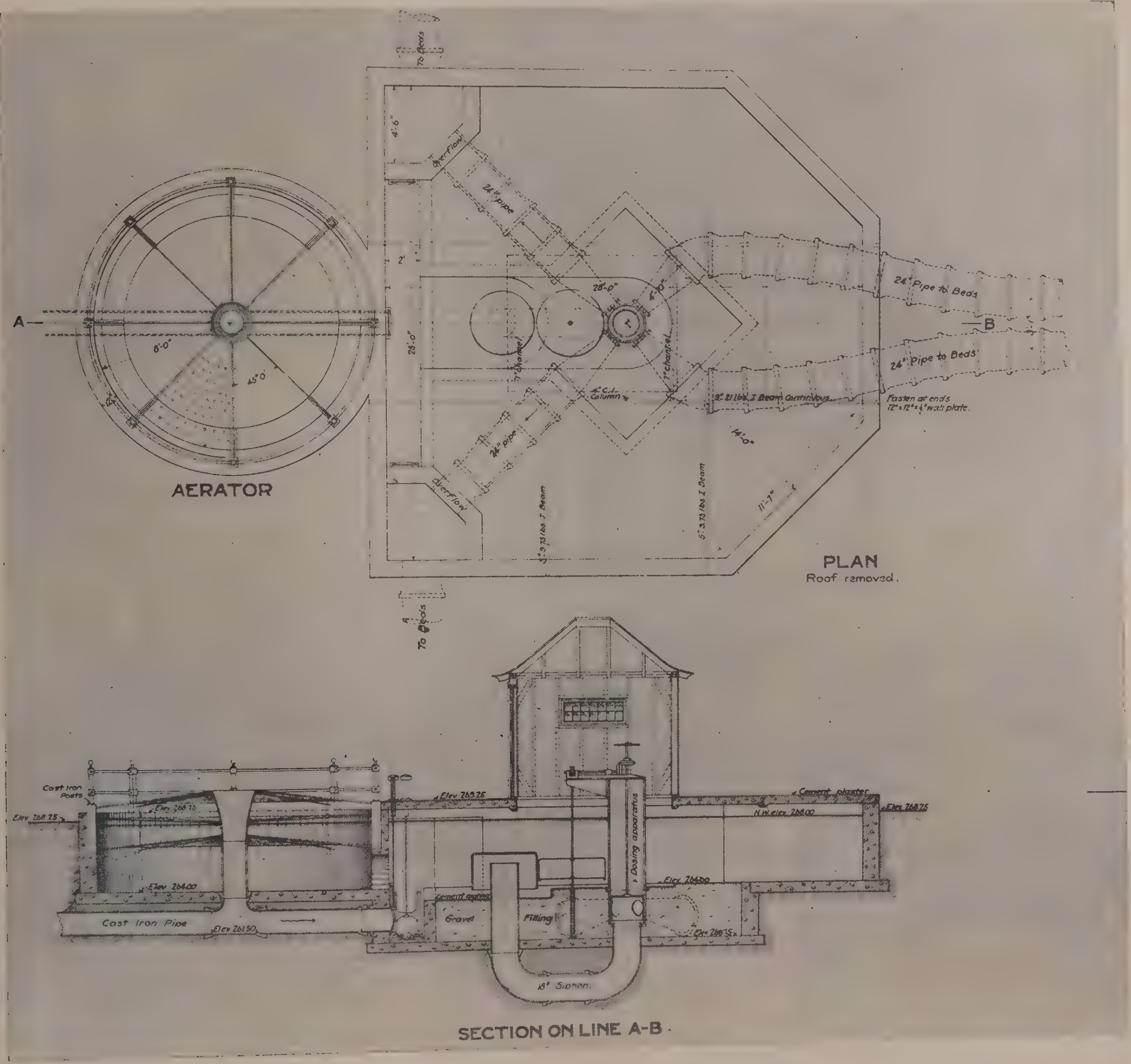
The filtration area is divided in 20 beds, 18 of which are about one acre in size, and the other two somewhat smaller. The embankments were constructed of the yellow subsoil, with about 9 in. of loam on the outer surface. Care was taken in the selection of the sand used in making the fills in the beds so that material of widely varying size of grain did not abruptly join. Wheel scrapers, wheelbarrows, and two-horse wagons were used in the grading, the actual cost of which was about 17 cents per cubic yard, but 5 cents of this is chargeable to trimming and finishing the surfaces.

The tank effluent is distributed over the acre beds in doses of 35,000 gal. through distribution pipes designed to carry 8 cu. ft. per second. The main distribution pipes are generally 24 in. in diameter and are laid in trenches excavated after the embankments had been raised to an elevation 2½ ft. above the grade of the pipes. Gate chambers of 8-in. brickwork, with 4-in. concrete slab covers, are placed in the embankments between the beds opposite their centers, and contain the gates necessary to deflect the sewage to any bed desired. The outlets from these chambers are 15-in. pipes extending through the embankments to the beds on either side and protected at their outer ends by concrete abutments. From each of these abutments a carrier extends 180 ft. across the bed. Its width is decreased from 5 ft. at the embankment to 1 ft. at the farther end by abrupt reductions of 6 in. on each side, in order to maintain a uniform depth of flow and a self-cleansing velocity. Its bottom is 6 in. thick, of Portland cement concrete mixed in the proportions of 1:3:5, and laid in sections 8 ft. long, with tarred paper in the joints between the sections to provide for temperature changes. Transverse iron bars were set in the concrete and extend the width of the carrier, with their ends turned up as supports for the 2-in. plank sides. Adjustable wooden gates at the outlets regulate the discharge if it is desired to throw unequal quantities on different parts of the beds. These carriers have been entirely successful in effecting the uniform distribution of sewage over the beds.

As stated before, the depth of the sand in the area was not determined and the ground-water table lies about 16 ft. below the original surface. Only one line of underdrains was laid under each bed at a depth of about 6½ ft., and a line of 10 to 15-in. drains was placed at a depth of 11 ft., and the smaller drains connected with it. In the main drain manholes were placed at the junction of the laterals, and the upper ends of all drains were turned up and carried to the surface, in order to induce a circulation of air and reduce the accumulation of carbonic acid gas in the body of the filters. The comparatively small amount of underdrainage has been found ample, as less than one-quarter of the filtrate finds an outlet through it, the greater part running off through the ground without appreciably raising the ground water level.

The total cost of the improvements of the sewerage system, exclusive of separation of the surface water drains, was about $165,000. The approximate cost of the different parts of the disposal plant was: The pumping station and machinery, $11,000; the force main, $24,500; the septic tanks, $15,500, and the filter beds $48,000. The plant was placed in commission under the direction of Mr. F. A. Barbour, who was in control of its operation until September, 1904. Systematic analyses of the sewage, septic effluent and filtrate were made during this time, and gaugings of the scum and deposit in the tanks taken with a Fowler sludge gauge once each week.

The quantity of sewage varies from 1,250,000 gal. per 24 hours to double that amount. It is strictly domestic, but relatively weak, except in the months of July and August, as the free ammonia averages 2 parts, the total albuminoid ammonia 0.4 parts, the oxygen consumed 5 parts, and the suspended solids 20 parts per 100,000. Since the beginning of the operation all the sewage has passed through three of the tanks and the fourth has never been filled. The time of retention in the tanks has varied from 10 to 15 hours, the shorter period occurring in August, when the sewage is strongest, but also at a time of highest temperature and consequent greatest bacterial activity. About 65 per cent. of the suspended solids have been removed by the septic treatment, and the remainder so finely comminuted and decomposed as to nullify its capacity for forming deposits on the filters. The tanks have never been emptied, since they were put in service in July, 1903, and no solid matter has been taken from them. Not more than 5 tons of scrapings have been removed from the surfaces of the filters, and this only from a desire for cleanliness.



Plan and Cross-Sectional Elevation of the Aerator and Dosing Chamber.

Septic treatment was begun in the summer at the time of maximum population, the result being a rapid accumulation of solids during the first two months. The septic action had scarcely commenced when an unusually severe winter set in. The average of the lowest temperature during December, January and February, following the beginning of operation in July, was 9.3° above zero, while in February this average was 4.8° above zero. There were 28 days of zero weather, and a minimum of 32° below zero during that time. The scum in the tanks became frozen to a depth of several inches under the masonry roof and the 18-in. earth covering over it.

The depth of the scum and the deposit continuously increased up to April, 1904, when about 44 per cent. of the entire volume of the tank was occupied by these accumulations as measured by the Fowler gauge. At that time the temperature of the liquid in the tanks had fallen to 41° Fahr. In May this temperature had increased to 50° Fahr., and the scum and deposit had reduced to 35.7 per cent. of the volume of the tank. In June the corresponding figures were 59° Fahr. and 24.5 per cent., in July 65° Fahr. and 23.4 per cent. In August when the sewage had reached its maximum temperature of 70° Fahr., the per cent. volume occupied by the scum and deposit had fallen to 21.4 per cent. Since then the temperature has lowered, and the accumulated solids on Jan. 1, 1905, occupied about 25 per cent. of the volume. The character of the scum and deposit as measured by the Fowler gauge is given in the accompanying table.

Character of Scum and Deposit as Measured by Fowler Gauge.

	Scum.	Deposit.
Moisture	86.5%	94.0%
Volatile matter	10.0%	4.5%
Mineral residue	3.5%	1.5%

The specific gravity of the scum averages about 0.975, and that of the deposit 1.025.

It is estimated that about 500 tons of dry solid matter have entered the tanks since the beginning of operation, and 175 tons of these solids have passed out in the effluent, so decomposed that no visible deposit in amount large enough to attempt its removal has appeared on the beds. On Jan. 1, 1905, about 100 tons of dry solid matter remained in the tanks, of which 12½ tons was in the form of deposit and the balance in the floating scum. The remainder, or about 225 tons, appears to have disappeared altogether by liquefaction in the tanks.

The purification of the septic effluent, on the basis of the free ammonia in the raw sewage and the filtrate, has varied from 99.3 per cent. in December, 1903, to 79 per cent. in March, 1904. The nitrates have ranged from 0.5 to 2.5 parts per 100,000. In midsummer twelve filter beds are used daily, the gates being changed twice; during the remainder of the year eight beds are used daily, one shift of gates being necessary. The average daily amount of sewage per bed is about 140,000 gal., applied in four doses. The entire 20 beds are kept in commission and used alternately, so that the average rate per day for the field is about 60,000 gal. per acre.

The cost of maintaining the filtration area has averaged about $140 a month, of which two-thirds is expended in trimming embankments, weeding drives and other work independent of the maintenance of the bed surfaces. The cost of power for pumping has averaged about $60 per month. The engineer of the water-works station visits the sewage pumping station once or twice each day, and the screenings, which amount to about 170 lb. per day in all months except August, when they are increased to 250 lb., have to be removed several times weekly. Allowing $50 per month for this attendance, the total cost of pumping is about $1,300 per year, and the entire cost of operating the disposal plant, including the lifting of the sewage and its purification, amounts to about $3,000 per year.

Mr. Geo. H. Wetherbee was the resident engineer in charge of construction. The disposal plant was built by Messrs. Seymour & Newell as a subcontract from Mr. A. M. Banker. All the work was done under the authority of the Sewer, Water and Street Commission of Saratoga Springs, of which Dr. D. C. Moriarta is chairman.

The Maintenance of New York State Roads.

The maintenance of the State highways of New York is explained at considerable length in one of the bulletins issued by Mr. Henry A. Van Alstyne, State Engineer and Surveyor, and as the suggestions made by him are of a general nature, the substance of them is given in this place.

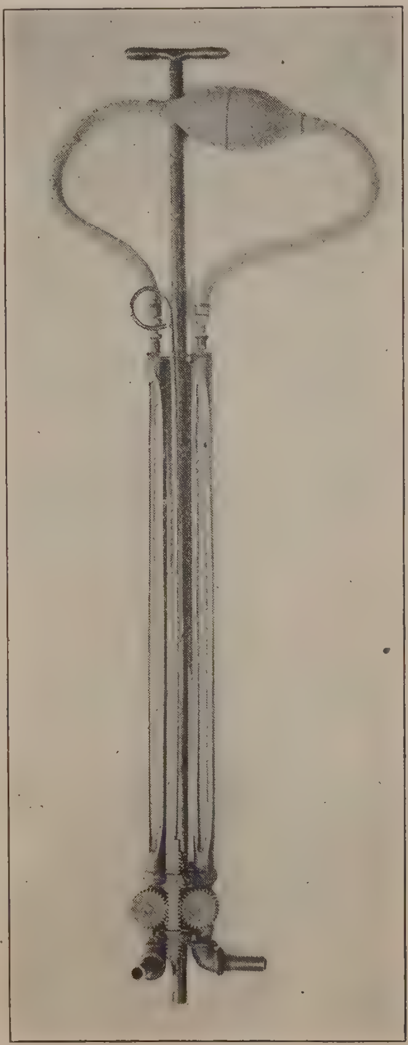
Maintenance of Gravel Roads.

After a newly constructed gravel road has been thrown open to traffic it should be carefully watched in order that any defects may be remedied at once. Shallow ruts and depressions should be repaired without delay or serious damage will be the result. In repairing a new road the gravel on the sides of the depression can be raked back in place; but after a time it will become necessary to fill the depressions with new material. In the latter case the old hardened surface should be slightly loosened with rakes in order to get a bond between the old and the new material. The gravel used should be smaller in size and should also contain more binding material than that used in the construction. This material should be stored in piles along the roadside, containing 15 to 20 cu. yd. each. Smaller piles are soon scattered and wasted.

Loose stones should be raked off the road surface as soon as they appear. They are uncomfortable for the travelling public, spoil the beauty of the road, and help to destroy it.

Care should be taken to immediately fill all the hollows and depressions in the center, made by the horses' feet, in order to avoid having water remain on the surface. If the gravel becomes saturated and soft it wears more rapidly and will soon rut. It is important that the crown of the road should be preserved and that water should not be allowed to run down the center, but should have an unobstructed flow to the side-ditches. In cases where the center has been worn hollow, the crown should be restored by adding the proper amount of suitable material. This work should be done when the road is wet and soft and the gravel will easily compact and bind together.

After a macadam road has been completed and opened to traffic, it is very important that the surface be kept smooth and free from depressions. It is of the greatest importance that the completed road should receive constant care and attention in order that any defect which may appear, may be immediately repaired before serious damage is done. The constant pounding of the shoes tends to loosen the binding material and the exposed stone in the top course. A few stones loosened in this manner and pounded around by the impact of the wheels have a tendency to loosen others and at the same time to loosen the binding material which is the more quickly blown away and washed off by the rain. Serious damage soon results from the common practice of driving in the track made by preceding vehicles, especially with heavy loads on narrow tires. Ruts would scarcely, if ever, appear on a well constructed road if drivers would vary their track even only a few inches. In some parts of the country obstructions of various kinds are placed at intervals to divert the travel from a beaten path. These obstructions are moved occasionally so as to direct the traffic either in long parallel lines or from one side of the road to the other in long easy curves. This method is objectionable, however, except on wide roads.



Pitot Tube Used in Sewage Gauging at Saratoga Springs.

If the repairs have been neglected and the macadam surface has been allowed to become loosened and porous and the drainage defective, water will soak through the stone and damage will result from frost. If the road is kept smooth and hard no damage will result from this source, provided the road is properly drained, but if the foundation becomes saturated, frost will not only heave the road but will break up the bond of the macadam and leave it rough and soft. Many ruts occurring after the spring thaws are due to this cause.

The amount of wear on a macadam surface varies in different sections and is governed by the climatic changes and conditions, the character of the stone used, and the amount and kind of traffic to which the road is subjected. It has been estimated that twenty per cent. of the wear is due to atmospheric causes and eighty per cent. to traffic, and that six-tenths of the latter cause is due to the horses' feet and four-tenths to the wheels.

In the maintenance of stone roads it should be remembered that "a stitch in time saves nine" and that the work of repair should be commenced as soon as the frost goes out of the ground in the spring. One of the most serious difficulties encountered is "ravelling," or the tendency of one stone after another to work loose from the mass and come to the surface. This occurs chiefly in the spring when the screenings have become loosened and perhaps partly blown off the surface. This may also occur on steep grades after the binding material has been largely washed off by heavy storms. Sprinkling is an effective remedy for ravelling but is impracticable on most country roads at the present time. It is used, however, on city, village and park roads and is the principal cause of their freedom from loose stones. Ordinarily the best remedy for ravelling on country roads is a coating of sand of proper quality, screenings or other suitable material, placed wherever the surface is bare or picked up. The loose stones should first be raked into piles on the roadside, then collected in wagons and hauled away. Generally these stones are worthless for patchwork as the corners have been worn off and the stone rounded making it difficult to get a bond with them. As a rule, only the middle 8 ft. of the road need be recovered, the sides of the road being well covered by the material washed and blown on them from the center. The sand to be used should be coarse and reasonably clean although a small amount of loam is sometimes beneficial in compacting and cementing the surface. The material should be spread on evenly to the depth of from one-half to one inch. Too heavy a coating is inadvisable since it ruts under the wheels and prevents the water from flowing freely after a rain. This coating should be renewed as often as may be necessary.

Ruts are most liable to occur in the spring or after a long rain when the road is soft. Small ruts will sometimes disappear if the traffic is diverted to one side by barricades for a time. In serious cases it is necessary to either pick down the loosened stone on the sides into the depression, or to fill the rut with new material.

The former remedy will often give the best results on a new road. If the repairs have been neglected until long ruts or hollows have been allowed to form, considerable work will be required. These ruts or depressions should be repaired in short patches, leaving sections of the unrepaired road in between, until the patches have been consolidated by traffic. This method is advisable as horses avoid long narrow stretches of stone and new ruts have a tendency to develop alongside the old ones.

In patchwork all screenings, dust and mud should first be thoroughly swept from the surface to be repaired and the old smooth surface slightly roughed up with picks. Broken stone of the same quality but a little smaller in size than the material used in construction should be used. The rut or holes should be filled with this material, care being taken to fill the loose stone a little above the old surface in order to avoid a depression after the stone has been properly consolidated. The loose stone should then be rolled until they are solid and firm in place. A steam roller is preferable but a horse-roller will do the work if used long enough; or if no roller is available, the mass should be tamped by a paving rammer until it is thoroughly consolidated. Screenings should then be swept into the stone until all the voids are filled and the patch should then be thoroughly sprinkled and again rolled or tamped. Unless the repairs are made in the spring when the macadam is soft, or during a rain, it is essential that water be used in repair work. If it is not used the stone will not bind together properly and will soon become loosened. Several light sprinklings are more desirable than one or two heavy flushings as the latter will wash away the binding material from the stone.

If the ruts, holes or depressions are very frequent the macadam should be resurfaced with a layer of hard broken stone from one-half inch to one inch in size, three or four inches in thickness, properly filled with screenings and rolled as required in the standard specifications for macadam roads of this department.

Considerable damage is often done to macadam roads by clay and loam being carried on the surface at intersections with unimproved cross roads. The clay or mud is brought on the improved road by the wheels and tends to pick up the stone from the top course leaving a rough surface. This material is often carried along the road several hundred feet. Where this occurs the mud should be scraped off and a coating of suitable material substituted. It is also advisable to cover the dirt roads with gravel or broken stone for a distance of two or three hundred feet from their intersection with a stone road in order that the undesirable material may be jarred off from the wheels before the macadam road is reached.

Heaving of the macadam in the spring as the frost goes out is caused by a poorly compacted and porous surface which lets the surface water into the stone, or by defective drainage. In either case it is necessary to secure a dry foundation. In extreme cases it may be necessary to lay tile under-drains, but ordinarily the defect may be remedied by cleaning and deepening the side ditches. It is sometimes effective to lay a line of porous tile under the macadam from the center of the road to the side ditches.

One of the most effective means of keeping a macadam road in good condition is a thorough rolling soon after the spring thaw. The roadbed at this time is wet and soft and in the most favorable condition for effective rolling.

The surface of the road should be kept at all times in such condition that the water can have an unobstructed flow into the ditches. Small depressions which allow water to stand should be filled up even with the surrounding surface with the smaller sizes of stone. The sides of the macadam sometimes become covered by an excessive coating of mud or dust which has been carried from the center either by traffic or heavy rains. This material holds the water on the road and prevents its reaching the ditches quickly and the excess should be removed.

The ditches and culverts should be kept free from obstructions at all times. All weeds and grass on the shoulders and ditches should be cut and removed from the road in the fall. Snow and ice should be removed from culverts before the spring thaw so that the water may flow away from the road quickly and without damage to it. On steep grades, during the spring thaw, the water has a tendency to follow down the wheel tracks made in the snow and ice and is apt to wash down to the stone and carry away the binding material. This water can easily be diverted to the side ditches.

A supply of broken stone and binding material, placed in piles about one-third of a mile apart, for repairs, should be kept along the road at all times. It is well to replenish these piles in the fall as it is often impossible to obtain the necessary material in the early spring when it is most needed.

Thomas Messenger Drown.

Few Americans have ever interpreted and applied scientific facts so directly for the welfare of the public as the late Dr. Drown. A large part of the famous work in sanitary research of the Massachusetts State Board of Health fifteen years ago was originated and directed by him. He was, moreover, a man of wide knowledge and broad sympathy with all sound progress, and engineering lost a valued adviser when he died. At the recent convention of the American Public Health Association, the following outline of his strikingly useful career was presented. It was written by Mr. Daniel D. Jackson, chief chemist of the New York Department of Water Supply, Gas and Electricity, who studied and worked under Dr. Drown for a number of years:

Thomas Messenger Drown.

The news of the sudden death on Nov. 17, 1904, of President Drown, of Lehigh University, from an operation for the removal of an intestinal tumor, has been received by thousands of chemists throughout this country and abroad with a deep feeling of personal loss. As a scientist and expert sanitarian his work is known throughout the two hemispheres. As a professor of chemistry, the former students of Lafayette College and of the Massachusetts Institute of Technology will ever hold him in grateful remembrance for the knowledge which he imparted of accurate, convenient and rapid methods of analysis and for his stimulation in them of a spirit of broad personal scientific investigation. As the president of Lehigh University, he decidedly increased the fame and prosperity of that great institution by his strong personality and marked executive ability. As a man in the complete sense of the word he has won the love and honor of all with whom he came into personal contact.

Thomas Messenger Drown was born at Philadelphia, Pa., March 19, 1842. He was graduated from the high school of his native city in 1859, and in 1862 received the degree of M. D. from the Medical School of the University of Pennsylvania. Neither therapeutics nor surgery was attractive to him, and after practicing medicine for a short period he turned his attention to chemistry, a subject which had strongly fascinated him during his course in medicine. He studied at Yale under Professors Brush and Johnson, and at the Lawrence Scientific School of Harvard with Professor Gibbs. He then took a course in chemistry and metallurgy in the School of Mines at Freiberg, Saxony, and later studied with Professor Bunsen at the University of Heidelberg.

Fully equipped with a technical education not then to be acquired in this country, he returned to America and became an instructor of metallurgy at Harvard. The following year he went to Philadelphia and for the four succeeding years he practiced in that city as an analytical chemist.

In 1875 he accepted the professorship of Chemistry at Lafayette College. In 1879 the building which was the home of the scientific department of Lafayette College was burned to the ground, and Dr. Drown directed his personal efforts and those of his assistants to saving the irreplacable records of the Institute and the back volumes of its Transactions, allowing his own private library to be utterly destroyed. In 1881 he resigned his position at Lafayette College in order to devote himself to the work of secretary of the American Institute of Mining Engineers. In 1884, after his resignation as secretary, he was elected honorary member, and some years later president.

He was given the professorship of Chemistry at the Massachusetts Institute of Technology in 1885, and in 1889, in addition, he was appointed chemist of the Massachusetts State Board of Health. In his work for the Institute of Technology he built up a large and successful department in chemistry which included at the time of his resignation 21 instructors and over 500 students. At the same time he was in charge of the chemical investigations of the waters of the State of Massachusetts, on which work some $250,000 has been expended. The wisdom of these expenditures and the importance of the results obtained have been everywhere recognized.

The records of his extended investigations on water were published for the most part in the annual reports of the Massachusetts State Board of Health, and up to the time of his death he was the consulting chemist of that Board. He published also various papers in the Technology Quarterly, the Transactions of the American Institute of Mining Engineers, and the Journal of the New England Water Works Association.

In 1895 he became the President of Lehigh University, and in the same year the degree of LL. D. was conferred upon him by Columbia University. The last nine years of his life were chiefly spent in broadening and increasing the scope of the courses of study at Lehigh University, and as its president the tact, wisdom and executive ability which he showed won for him the love, respect and admiration of all.

He was a prominent member of many scientific societies, among which were the American Institute of Mining Engineers, the British Iron & Steel Institute, the American Chemical Society, the Society of Chemical Industry, the American Philosophical Society, the Academy of Natural Sciences, the American Academy of Arts & Sciences, the Boston Society of Civil Engineers, the New England Water Works Association, the Berzelius Society, and the American Public Health Association.

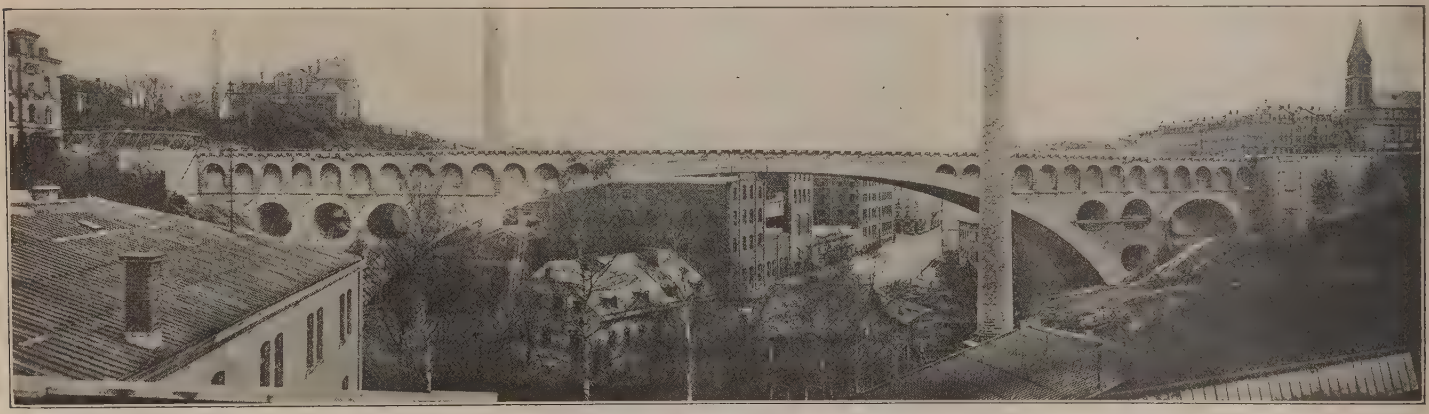
Dr. Drown was married to Miss Helen Leighton, of London, England, whom he met while a student at Heidelberg. The social side of his character was as highly developed as the scientific side and he was an excellent critic of music and literature.

The Large Arch at Plauen, Saxony.*

A detailed description of the 295.2-ft. masonry arch at Plauen, Saxony, was printed in this journal on March 26, 1904. It has the longest single masonry span in the world and carries a city street over a valley where masonry piers for a bridge of shorter span were not considered desirable. The structure was designed by Mr. C. H. Liebold, of the firm of Liebold & Co., Langebrueck, Saxony, the contractors for the work. The accompanying view of the bridge is reproduced from a photograph showing its condition at the close of 1904, at which time the corbels for the parapet were just finished.

The bridge carries a roadway 36.1 ft. wide, with two car tracks, and two 9.8-ft. sidewalks. The main arch is of the five-centered type, with radii of 344.5, 191.9 and 98.7 ft. The ratio of rise to span is 1:5. The thickness at the crown is 4.92 ft.

The arch is built of a hard local slate with granite trimmings. The foundations are on the firm rock sides of the valley and had to be carried only a few feet below the surface. The arch weighs about 12,000 tons and settled a trifle less than an inch when the centers were stuck. The cost of the finished bridge will be only about $125,000, which is as interesting in its way as the great span.



The 295-Foot Masonry Arch over the Syra Valley at Plauen, Saxony.

Progress on the Reconstruction of the Sewage Disposal Works at Manchester, England.

The conversion of the chemical treatment tanks of the sewage disposal plant at Manchester, England, to septic tanks is now nearing completion, and recent experience in the operation of the plant was reviewed in a paper at the annual congress of The Sanitary Institute by Mr. Gilbert J. Fowler, formerly chemist at the works. The varying conditions under which the tanks were operated during the past year, due to the change in the method of treatment, have obviated to some extent detailed observations and required occasional irregularity in the manipulation of the plant. The total amount of sludge removed from the open septic tanks during the year was about 21,000 tons, or 6 tons per 1,000,000 imp. gal. of sewage treated, as compared with 14½ tons, the average amount of sludge per 1,000,000 imp. gal. obtained by chemical treatment during the previous four years. A portion of this 21,000 tons was removed more on account of convenience than from necessity due to the irregularity in operation.

Nearly all of the 46 acres of contact beds which are being constructed in connection with the change in the method of treatment are in operation. As new beds are brought into the system the time of contact has been gradually reduced from 24 hr. to 2 hr., the latter being the usual time of contact at present allowed on matured beds, though when the sewage is dilute, one hour's contact has been found to be adequate. In general the time of filling is about one hour.

In order to prevent as far as possible the suspended matters of the tank effluent from passing into the body of the bed, trenches are cut on the surface after the beds have been in operation for some months and the clinkers in them have settled down. These are lined with an inch or two of fine screenings. The suspended matter tends to accumulate in these trenches, and in time to prevent the ready percolation of the water. When this is the case the trenches are scraped, and the scraped-off material either placed at the side of them to dry or removed from the bed. The scraping has generally been necessary about once in six weeks. More recently the scraping of the trenches has become less frequently necessary, it appearing that their surfaces become somewhat loamy and less liable to be blocked by a greasy or gelatinous deposit, and a slight raking of them is in many cases sufficient.

A large portion of the suspended matter is retained in these trenches, but it has been found imperative that the rate of flow on to the beds be adjusted and the sides of the trenches carefully kept in place, so as to avoid admitting the tank effluent directly into the body of the bed. This method of working the beds has helped to retain their capacities, and in one case after nearly 700 fillings, the capacity of the bed was 31.5 per cent. of the empty tank. The average reduction in capacity of five beds on which comparatively accurate measurements were made over a time varying from three to nine months was about 3.4 per cent. per month of the total capacity.

The characteristics of the average filtrate obtained from the matured half-acre beds was about as follows: The oxygen absorbed varies from 2.3 to 2.9 parts per 100,000; the albuminoid ammonia averages about 0.19 parts per 100,000; as a rule, from 50 to 60 per cent. dissolved oxygen is present in it after 48 hr. incubation of 80° Fahr., with aërated tap water in the proportion of 1 of sample to 9 of water; it is seldom putrefactive on incubation; nitrification is always well advanced; and there is a tendency to form a deposit on standing, but seldom more than 3 gr. per imp. gal.

Twenty-seven acres of contact beds, designed to treat storm water and the dilute night flow in dry weather have been completed for some time, and, in order to produce as good an average effluent as possible pending the completion of the works, the effluent from the chemical treatment of a part of the day sewage has been turned on them. The results relative to these beds in Table I are the average of those obtained while they were working in this manner; those in Table II, the average of the results obtained while they were treating the storm-water flow on different occasions. The relatively high degree of purification effected by them as compared to that of the other beds is due in a measure at least, to the finer material in them, and to the fact that they are only filled once a day in dry weather. It has not been found necessary to scrape the surface of the beds immediately upon them showing signs of becoming less pervious. So long as the requisite quantity of tank effluent can be passed through them in a given time, the degree of purification, it is said, is not impaired, but rather increased, by a certain amount of surface resistance. When, however, the upper surface of a bed becomes really sodden, the purification rapidly falls off and it becomes necessary to rest the bed and loosen its surface.

Table I.—Average Results of Eleven Months' Operation. (In parts per 100,000.)

	Raw sewage.	Septic tank effluent.	Filtrate	
			Primary.	Storm bed.
Oxygen absorbed, 4 hrs.	10.54	8.20	2.72	1.65
Ammonical nitrogen	2.27	2.63	1.62	1.06
Albuminoid nitrogen	0.52	0.37	0.16	0.11
Nitric nitrogen	....	....	0.28	0.64
Dissolved oxygen.*	....	....	0.46	0.27
Filtered,† Imp. gal.	....	....	78.4	78.0

*Percentage taken up in 48 hr. at 80° Fahr.
†Per cu. yd. per day.

Table II.—Average Results of Treating Storm-Water Flow on Storm Beds. (In grains per Imp. gal.)

	Oxygen absorption, 4 hrs.	Albuminoid ammonia.
Raw sewage	5.64	0.29
Tank effluent	4.10	0.19
Final effluent	2.64	0.13

The high oxygen-absorbed figures are due chiefly to the presence in the raw sewage of large quantities of effluent from various manufacturing plants containing spent oxide washings, the sulphocynates in which readily consume oxygen. The treating of these effluents before their entry into the sewer is now being considered. The total cost for labor and incidental expenses, including the whole of the expenditure in connection with the experimental beds, has been about 90 cents per 1,000,000 imp. gal. filtered. This item does not include any fixed charge for renewals and washing of the beds in the future, but it is stated it may be taken as the average cost of operation.

CURRENT NEWS SUPPLEMENT

JANUARY 21, 1905.

RECTORY OF NATIONAL ENGINEERING SOCIETIES.

ıMERICAN SOCIETY OF CIVIL ENGINEERS. cretary, Chas. Warren Hunt, 220 West 57th , New York.

ıMERICAN SOCIETY OF MECHANICAL ENGIERS. Secretary, F. R. Hutton, 12 West 31st ., New York. Next meeting, Jan. 31, 8:15 M., New York; Rear-Admiral Geo. W. Mel-.le, on "Epochs in Marine Engineering."

AMERICAN INSTITUTE OF ELECTRICAL ENGIERS. Secretary, Ralph W. Pope, 95 Liberty :., New York.

AMERICAN INSTITUTE OF MINING ENGIERS. Secretary, R. W. Raymond, 99 John :., New York.

AMERICAN INSTITUTE OF ARCHITECTS. ecretary, Glenn Brown, Washington, D. C.

ASSOCIATION OF ENGINEERING SOCIETIES. ecretary, John C. Trautwine, Jr., 257 South ourth St., Philadelphia, Pa.

AMERICAN SOCIETY OF HEATING AND VENTIıTING ENGINEERS. Secretary, W. M. Mackay, 35 Water St., New York.

CANADIAN SOCIETY OF CIVIL ENGINEERS. ecretary, Clement H. McLeod, 877 Dorchester t., Montreal. Annual meeting, Montreal, an. 24-26.

SOCIETY FOR THE PROMOTION OF ENGINEERNG EDUCATION. Secretary, Prof. M. S. etchum, University of Colorado, Boulder, olo.

AMERICAN SOCIETY FOR TESTING MATEIALS. Secretary, Prof. Edgar Marburg, Uniersity of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF MUNICIPAL IMROVEMENTS. Secretary, George W. Tillson, oom 12, Municipal Building, Brooklyn, N. Y.

ASSOCIATION OF RAILWAY SUPERINTENDENTS F BRIDGES AND BUILDINGS. Secretary, S. F. aterson, Concord, N. H.

AMERICAN RAILWAY ENGINEERING AND AINTENANCE OF WAY ASSOCIATION. Secreary, L. C. Fritch, 1562 Monadnock Block, hicago.

AMERICAN WATER-WORKS ASSOCIATION. Secetary, J. M. Diven, Elmira, N. Y.

AMERICAN FOUNDRYMEN'S ASSOCIATION. ecretary, Richard Moldenke, P. O. Box 432, ew York.

ENGINE BUILDERS' ASSOCIATION OF THE NITED STATES. Secretary, J. L. Lyle, 39 ortlandt St., New York.

ANNUAL MEETING, AM. SOC. C. E.

The annual meeting of the American Society f Civil Engineers was held at the Carnegie yceum, New York, on Jan. 18. It was largey attended. The satisfactory report of the oard of Directors aroused general satisfacion. During the year the net increase in nembership was 279, the largest on record, he total membership on Jan. 1 being 3,203. The rate of growth in the past has been as ollows: Annual increase, 1870-78, 48; 1879-8, 61; 1889-98, 89. The Board reported a teady increase in the use of the Library, and lso in the research work by the assistant ibrarians for non-resident members.

After careful consideration, the Board deided early in the year to acquire, if possible, dditional land for the enlargement of the resent House, and at its May meeting, at which twenty members of the Board were resent, unanimously authorized the purchase f the lot, 25 ft. front, with an average depth f 116 ft., immediately adjoining the present roperty on the west, and on June 6, 1904, the title to this property passed to the Society. The price of this lot was $100,000, nd it was necessary that the mortgage debt should be increased to pay for it. The old mortgage debt was $55,000, and it was decided to borrow $120,000 additional, so as to provide, after payment in full of the purchase price, $20,000 additional, available for building purposes. The Society now owns a plot with 75 ft. frontage on 57th St., with an average depth of 113 ft., for which it has paid $180,000. A conservative estimate of the present market value of this plot (without buildings) is $255,000, the Board stated. It was not deemed wise to undertake building operations at once, partly on account of the state of the building trade, and partly because the general disorganization incident to such operations would interfere with the comfortable reception of the many foreign engineers during the year. The Board has the matter under advisement, general plans are now being prepared and it is expected that the work of enlargement will go on during the next season.

The report of the Secretary showed the receipts of the year to be $279,380, of which amount $26,891 was the balance carried forward from 1903, $8,275 was from entrance fees, $53,534 was from dues and $175,000 was from the bond and mortgage transaction mentioned above. The expenditures were $229,452, of which $21,347 was for salaries and labor, $13,028 for publications, $13,579 for the International Engineering Congress, $55,000 for the bond and mortgage transaction, and $101,095 for building and lot. The minor details of the statement need not be mentioned here.

Progress reports were presented from the Committee on Uniform Tests of Cement, on Rail Sections, and on Concrete and Concrete-Steel, and the committees were continued. At the request of the last committee the title "Concrete-Steel" was changed to Reinforced Concrete."

The following members were elected to the Nominating Committee, which selects candidates for offices to be filled a year hence: C. L. Harrison, John R. Freeman, Chas. F. Stowell, James K. Lyons, C. F. Loweth, J. A. L. Waddell and J. D. Isaacs.

On motion of Samuel Whinery, it was voted to request the Board of Direction to investigate the desirability of having the Society, through the Board, suggest the names of men qualified to serve on important technical commissions, when so requested. This report is to be presented at the next annual meeting. The subject was discussed by Messrs. Croes, Hague, Williams, Crowell, Brinckerhoff, Boller, Stearns, Bogart, North, and others, and while many of the speakers were opposed to the adoption of the policy, the general opinion was that the matter was too important to decide without giving all members an opportunity of expressing their views.

The awards of prizes in 1904 were as follows: Norman medal, Emil Low; Rowland prize, G. C. Kenyon; Collingwood prize, H. J. Wild.

The election as honorary members of Sir Wm. Henry White and Robert B. Gorsuch, sole living member of the group of twelve engineers who organized the Society on Nov. 5, 1852. Mr. Gorsuch has lived in Mexico for many years.

It was announced that the next convention would be held in Cleveland in June.

The election of officers resulted in the selection of the regular nominees: President, C. C. Schneider; vice-presidents, M. L. Holman and Emil Kurchling; treasurer, Joseph M. Knap; directors, Austin L. Bowman, Morris R. Sherrerd, H. Bissell, Edwin A. Fisher, Wm. B. Landreth and George S. Pierson.

The social features of the meeting included a reception, visits to the new yards of the Pennsylvania R. R. at Greenville, N. J., and the filters of the Hackensack Water Co., and a smoker.

NEW ENGLAND WATER WORKS ASSOCIATION.

The annual dinner of the New England Water Works Association was held at Hotel Brunswick, Boston, on Jan. 11. For the first time in its history the association entertained ladies at its annual dinner. An address was delivered by the retiring president, Edwin C. Brooks, of Cambridge, and the following officers were declared elected:

President, George Bowers, of Lowell, Mass.; vice-presidents, James Burnie, Biddeford, Me.; Frank A. Andrews, Nashua, N. H.; George E. Crowell, Brattleboro, Vt.; Frederick W. Gow, Medford, Mass.; Edmund W. Kent, Woonsocket, R. I.; Charles E. Chandler, Norwich, Conn.; secretary, Willard Kent, Narragansett Pier, R. I.; treasurer, Lewis M. Bancroft, Reading; editor, Charles W. Sherman, Boston; advertising agent, Robert J. Thomas, Lowell; additional members of executive committee, Frank E. Merrill, Somerville, Mass.; George A. Stacy, Marlboro, Mass.; James L. Tighe, Holyoke, Mass.; finance committee, W. W. Robertson, Fall River, Mass.; R. C. P. Coggeshall, New Bedford, Mass.; Henry L. Thomas, Hingham, Mass.

Mr. Desmond FitzGerald read a paper on the water supply of Manila, and life in the Philippines. The association now has 604 members.

THE CONVENTION OF THE MICHIGAN ENGINEERING SOCIETY.

Engineering features of municipal work claimed a large portion of the time of the twenty-sixth annual meeting of the Michigan Engineering Society, which was held at Lansing, Jan. 11, 12 and 13. A year ago the committee on municipal affairs was delegated to prepare a model street railway franchise and through their chairman, Mr. W. W. Bridgen, city engineer of Battle Creek, they brought in a report. The franchise outlined in this report, with a few minor modifications, had already been used by the above named city, having been granted to the Battle Creek & Grand Rapids Inland Lake Traction Co., during the latter part of December.

The term of the franchise is twenty years, the municipality reserving the right to purchase the property of the company lying within the city limits at any time during the life of the franchise, payment to be in cash or 4 per cent. bonds, the value of the plant to be determined by an arbitration board of three members, appointed by a circuit judge of the county. In case of purchase by the city, the company has the option to lease the use of the tracks for an annual rental which shall not exceed 4 per cent. of the purchase price. Also, should the city at any time during the twenty years grant a franchise to another company, the new company should have the right, if it so desired, of renting the tracks of the old company.

The motive power shall be electricity, or such other power, except steam, as shall be provided for by amendment to the franchise. The rails inside the city and those for a half mile outside are to be insulated from those beyond the half-mile limit, and all systems of returns proposed by the company shall be submitted to the Board of Public Works for their approval. Should the city at any time desire to change the grade of any of its streets, the company is to relay their tracks to the new grade without expense to the city, and should at any time the car traffic become heavy enough so that it would be impossible to maintain the street in good shape, some concrete construction approved by the city engineer shall be used in place of the wooden ties. When bridges are built which carry both the car track and the roadway, the company bears a proportion of expense in the ratio of 8 ft. to the width of the bridge. No train shall consist of more than two cars and provision is made for the moving of the larger portion of the freight after 8 p. m. Free transportation over the company's lines within the city is to be furnished to police, firemen and mail carriers when in uniform, and to city officials when in discharge of their duties.

The Society decided to embody the report in its annual "Proceedings," but did not accept it as an entirety, there being several points with which a number of the members did not agree, the last one on free transportation coming in for a good share of adverse criticism. The article referring to the portion of cost of bridges to be borne by the company was generally considered too lenient, one-third to one-half of the total cost being thought a fairer proportion to be paid by the company. The point was raised that a franchise is likely to be written with regard to its legal aspect only, and that more definite specifications should be an added feature of the franchise, as generalities were likely to involve the company and the municipality in the same trouble that they do the two parties to any ordinary contract. Regarding the term of the franchise, an arbitration system was advocated which would, at the end of half the life of the franchise, determine from the then present conditions and the future outlook, the flat amount or the percentage of gross earnings to be paid by the company to the city during the remaining half of the life of the franchise.

Prof. Davis, of the University of Michigan, presented the subject of "Municipal Ownership." He said in part: "When there was no town nobody wanted franchises, they became valuable only when people collected there. The people created this value and it is a property of which they are unable to divest themselves. Many persons togther should live better than a few apart and values which they create should be used for their good. American cities have formed the habit of giving to private parties the control of things that are productive and retaining the control of things which are unproductive. Street railways, water-supply, gas, telephone and telegraph franchises are given away indiscriminately, and works such as street construction, repair and cleaning, drainage and sewer construction, that require only expenditure, are left in their control. These unproductive expenditures should be met by excess of receipts from profitable monopolies. Cities have always prospered by government from within, suffered by government from without. The charge is made that under municipal ownership corruption creeps in, but city officials who cannot exercise supervision over the property of the city without corruption are not competent to dispose of franchises. The American system of having a board for each department of a city's work is a system of irresponsibility; there is too much machinery, not enough harmony among these boards, and this system cannot hope to yield the results that are obtained under the European system where there is more centralization of responsibility."

"The Pintsch Suction Gas Producer" was the title of a paper read by Schuyler F. Seager, and was designed to show the advantage of a suction gas producer over the older type of apparatus. Anthracite, coke or bituminous coal can be used as the fuel the first named giving the cheapest production of gas. When the fire is first started a small blower, which is run by hand or foot power for units up to 150 h.p., is used. When the temperature has become high enough for proper gas generation, the gas is admitted to the engine and the suction stroke of the engine furnishes the draft through the fire. The heat of the CO gas is nearly all taken up in forming the steam which gives up its hydrogen to form the producer gas, and but little energy is lost in the scrubber which finishes the cooling process and extracts the dust particles. The gas next passes through the cleaner, which is filled with sawdust, and all the remaining impurities are extracted, the claim being made that where anthracite is used in the generator, an engine can be run six months without needing cleaning. In connection with the apparatus the engine is equipped with governor control on the admission of both air and gas. The claimed advantages of the suction gas producer over the pressure producer are: that owing to the partial vacuum which exists in every part of the apparatus there is no leakage of gas, clinkers and ashes can be removed at any time during the working, and only the actual amount of gas used by the engine is generated. Only a few of these plants have so far been installed in this country, but they are coming into common use in Belgium and Germany, where the system originated. Tests have shown that for units of 50 h.p., 1 lb. of anthracite will produce one horse-power-hour, and with larger units this can be cut down to 0.75 or 0.80 lb.

Prof. C. L. Weil, of the Michigan Agricultural College, described in some detail the new central heating and power plant and the tunnel system recently installed there at a cost of $130,000. The buildings to be supplied are quite scattered and the problem of location of the main power plant was solved by shifting the location to different points upon a pasteboard diagram and making estimates of the cost of piping, wiring and tunnel systems to all of the buildings from each point. There was 4,100 ft. of tunnel in all, 2,600 ft. of which was of the largest size, 6 ft. in width and 6½ ft. in height. The branches were somewhat decreased in size, the smallest of these being 4 ft. wide and 4½ ft. high. The section was built with a flat bottom and straight sides with a semi-circular arch for the top. Tests on similar sections of smaller size always gave the line of rupture at some place in the arch. All of the construction was in open cut, the greater depth being 22 ft. The under-drain is made of 4-in. tile. A large amount of quicksand was encountered which caused some delay in the time of completion. A 1:2:4 broken stone concrete was used. At present the tunnel is to carry lighting wires, high and low pressure steam with return mains laid to a 0.3 per cent. grade. The wiring is to be carried in the arch of the tunnel, the steam mains by rockers resting on the floor. The engines, pumps and dynamos have not yet been installed. The boilers are five in number, 150 h.p. each, of the internally fired Scotch marine type, fitted with Underfeed stokers. The coal shed has a capacity of 1,200 tons with an overhead hopper for each of the boilers, the ashes being removed in a car running in a tunnel 6½ ft. in height. The chimney is 125 ft. in height and is built of buff radial brick.

Michigan has been essentially a lumber State and what to do with the land from which the valuable timber has been cut off as well as the jack-pine lands, has of late years been one of the State's largest problems. Mr. S. Harlan Baker, in a paper on the subject, suggested a general solution which has heretofore received little attention. The best of this land is being used for agricultural purposs, but there are thousands of acres where the soil is light and sandy, which are constantly reverting back to the State because of unpaid taxes. The great cry throughout the State has been for reforestation, but it is a difficult matter to interest private individuals in the investment of capital where they are forced to wait 20 to 25 years before receiving any returns. Also the acreage of this land is entirely too much to hope for a large part of it being planted to young trees at any time. Mr. Baker's solution was a system of irrigation. There are a number of small lakes and streams scattered over these lands, the water from which could be used at a small expense for purposes of irrigation, and large areas which now go to waste could, he said, be profitably used for agricultural purposes.

"Methods of Figuring Costs" was the title of a paper by Mr. C. E. Bement. He considered the individual system of cost-keeping better adapted to exclusive piece-work shops than the continuous system and warned shop superintendents against accepting in total any outside system of cost-keeping, as there are points in the management of any individual shop in which it differs widely from any other of its same class and a system to fulfill its full purpose, that of detecting leaks and all places where improved shop methods will lessen cost of production, must conform readily to the requirements of the individual shop.

The main points in connection with the construction of the Bridge St. bridge, recently completed at Grand Rapids, were given by P. M. Louwerse. The bridge is of concrete steel construction, Thacher bars being used. The bridge is built in five spans with a width of 66 ft. and a total length of about 496 ft. The concrete was laid in transverse sections, each section of 15x66 ft. being required to be completed in one day.

A concrete pump pit built at Bangor, Mich., during the past year was described by W. H. Goss. Water in the two wells that supply the city rises to within 7 ft. of the top of the ground, but can be pumped down to 21 ft., and the suction of the pumps had proved unsatisfactory. The pit was built of concrete, 18 ft. in diameter and 12 ft. deep. A layer of water-bearing sand gave trouble and a sump was made at the bottom during construction, from which the water was pumped. There was some leakage from the sides and the forms were cut down enough so that a layer of 1:2 mortar 3 in. thick could be rammed on the inside of the side walls. Several coatings of cement wash were afterwards applied, and no further trouble was experienced from the sides. A string of 4-in. tile was laid near the circumference of the bottom and led the water to the sump. The bottom was then laid, and lastly the sump was concreted. The upward pressure on the bottom of the pit when water stands within 7 ft. of the top of the ground, is 437 lb. per square foot, the weight of the pump and the concrete gives 140 lb. downward pressure, leaving an unbalanced upward pressure of 297 lb. per square foot, which the concrete is thought to be able to withstand.

A recent change in the water supply of Battle Creek was reported by W. W. Brigden to have caused the users of water in that city to array themselves with one or the other of two factions, manufacturers and launderers wishing the old supply of almost soft water from the lake continued and filters put in to decrease the danger of contamination, while the users of small amounts favored the new supply with a large amount of iron which was also quite hard. This new supply was obtained from wells sunk 100 to 150 ft. in Marshall sandstone. Gognac Lake, from which the old supply was obtained, has an area of but 360 acres, and at times during the summer there are 1,000 people living on its shores. The possibilities of contamination being great, it is expected that the new supply will soon entirely replace the old.

The Committee on Roads and Paving presented a report, the major portion of which was given over to a discussion of tar-macadam pavement. Encouraging reports concerning these pavements came in from all sections of the state, but an instance of failure was reported from Port Huron, where the sub-grade of the street had been quite spongy when the rolling was finished.

State Geologist Lane asked for the co-operation of the engineers of the State, especially the railway engineers, in procuring elevations at all towns in the State for a new edition of Gannett's "Dictionary of Altitudes."

The nominating committee brought in the following names for officers of the Society: President, H. K. Vedder, Agricultural College. Vice-Pres., A. C. Lane, Lansing; F. Hodgman, Climax. Secy.-Treas., A. L. Holmes, Grand Rapids. The election will be by letter ballot the latter part of April. There are now two grades of membership in the society and the Board of Directors at its next meeting will consider a third one, that of Junior, the object being to encourage seniors and graduates of technical schools to become members.

ANNUAL MEETING OF THE IOWA ENGINEERING SOCIETY.

The seventeenth annual meeting of the Iowa Engineering Society convened in the auditorium of the Liberal Arts Building of the State University of Iowa, at Iowa City, on Jan. 11. Addresses of welcome were given on behalf of the city by Mayor F. K. Stebbins, and on behalf of the State University, by President George E. MacLean. Responses were made by L. H. Stone and Prof. A. Marston. Papers were read by L. E. Ashbaugh on "Topographical Survey of Meandered Lake Beds"; Geo. M. Thompson on "Assessing Cost in Drainage Districts"; J. J. Ryan on "Rebuilding the Muscatine Waterworks"; J. M. Brown on "C. R. & P. R. R. Shops, Moline, Ill.," illustrated by photographs showing progress of the work.

The report of the Committee on Railroad Engineering, by J. D. Wardle, and the report of the Committee on Roads and Pavements, by Prof. A. Marston, outlining the work of the Highway Commission at the Iowa State College, were presented during the second session. The second report was discussed at length, the principal point being in regard to proper binding material for macadam roads. The papers of the session were "Capacity of Flowing Streams for Power without Storage," by Prof. Wm. G. Raymond, illustrated by lantern-slide diagrams, and "Power of Running Streams as Affected by Flood," by Prof. Sherman M. Woodward.

At the third session, on Jan. 12, the report of the Committee on Surveying and Drainage, Seth Dean, brought out a discussion of the new drainage laws of Iowa. The report of the Committee on Sanitary Engineering, Prof. C. S. Magowan, was supplemented by a paper on "Inaugurating Sewer Construction and Some Defects in the Iowa Sewer Laws," by Chas. P. Chase. "Track Revision on the C. B. & Q. R. R.," was described by W. L. Breckenridge. A paper on "The Bacteriological Examination of Water as it Concerns the Sanitary Engineer," by Dr. Henry Albert, was illustrated by charts and an exhibition of apparatus.

In the afternoon the society made a trip of inspection to Cedar Rapids over the Cedar Rapids & Iowa City Ry., in a special car furnished by the officials of the road.

At the fourth session the following papers were read: "Sewerage System of Des Moines," by L. H. Stone; "Municipal Engineering for Small Towns," R. B. Slippy; "Water Problem in a City of 18,000 People," C. T. Wilson; "The Marshalltown Reservoir," C. A. Baughman; "Cement and Concrete Construction," Chas. P. Chase, being hints on the subject suggested by practice; "Iowa Avenue Culvert, Iowa City," a piece of reinforced concrete construction illustrated by lantern slides, by Prof. C. S. Magowan.

At the fifth session the papers were: "Concrete Dam at Manchester, Iowa," B. J. Lambert; "Concrete Steel Bridge, Kankakee, Ill.," J. B. Marsh; "Notes on Cost of Relaying Brick Pavement with Cement Filler," C. A. Baughman. A general discussion of the comparative merits of cement filler and sand filler followed. Reports of committees were given by Prof. G. W. Bissel, on Mechanical Engineering; Prof. L. B. Spinney, on Electrical Engineering, and Chas. P. Chase, Iowa Elevations. A paper on "Land Surveys," by C. R. Allen, was also presented.

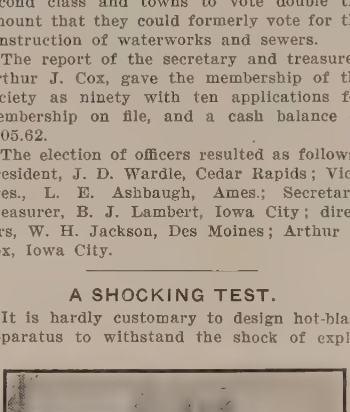
The report of the Committee on Special Legislation, was presented by Arthur J. Cox, at the sixth session. It showed that the committee had succeeded in getting the last legislature to pass a bill enabling cities of the second class and towns to vote double the amount that they could formerly vote for the construction of waterworks and sewers.

The report of the secretary and treasurer, Arthur J. Cox, gave the membership of the society as ninety with ten applications for membership on file, and a cash balance of $105.62.

The election of officers resulted as follows: President, J. D. Wardle, Cedar Rapids; Vice-Pres., L. E. Ashbaugh, Ames.; Secretary-Treasurer, B. J. Lambert, Iowa City; directors, W. H. Jackson, Des Moines; Arthur J. Cox, Iowa City.

A SHOCKING TEST.

It is hardly customary to design hot-blast apparatus to withstand the shock of explosion, but the substantial character of such an apparatus built by the B. F. Sturtevant Co., for the Fabrikoid Co., of Newburgh, N. Y., is evidenced by the accompanying reproduction of a photograph taken shortly after an explosion of 1,500 lb. of gun-cotton within the building containing the apparatus.



FAN AND HEATER AFTER THE EXPLOSION.

The building was of wood and practically air-tight, which made the force of the explosion greater. What is shown in the picture is all that was left. The fan and heater were intact, except that one name-plate was blown off the fan; otherwise it was in perfect condition. The wheel turned with ease and ran as true as if it had just been set up. The steam connection to the heater was not harmed, although the asbestos covering on the pipe was blown off. The fan is running to-day just as if nothing had happened.

PLAN FOR RAILWAY TERMINAL STATIONS IN CHICAGO.

A solution of the railway terminal problem in Chicago has been proposed by Mr. Frederic A. Delano, lately general manager of the Chicago, Burlington & Quincy lines east of the Missouri river. Mr. Delano's suggestions are embodied in a book which has been distributed to business men of Chicago. The book is well illustrated by drawings and maps.

The plans contemplate five and probably six terminal stations, each to be used by one of the railway systems, erected in juxtaposition to each other, to occupy the space between 12th and 14th Sts., State St. and the river. If the sixth station were erected, the space occupied would extend on the west to Canal St. Space north of 12th St. would be occupied by an office building to be utilized by the several railway companies.

Several factors were taken into consideration in selecting this location. Practically all of the property on the proposed site is already owned by the railways. Of the roads entering Chicago, with the exception of the Chicago & Northwestern and the Chicago, Milwaukee & St. Paul, all come in at a point south of the proposed site. While the location chosen is at some distance from the business district at present, the future growth of the city will throw the down town district farther south. It would, moreover, be an easy task to connect the station with the business district by means of electric lines.

The scheme involves an elevated road, operating shuttle trains, to be built connecting the South Side line at 12th St. and the West Side system at Halsted St.

Mr. Delano suggests that the passenger tracks be at least 20 ft. above the present level. The space beneath these could be utilized for handling baggage, express, mail and less than car-load freight. State St. and Wabash Ave. would continue through at their present level. It would be necessary to elevate Clark St. and Fifth Ave. from 12th to 16th Sts. The space underneath these tracks could be utilized for railway tracks, teaming purposes and freight houses. The south branch of Chicago River, which sweeps in toward the east at the proposed site would be straightened between 12th and 16th St. The river frontage would offer facilities for better connecting railway and lake traffic.

The centralizing of the passenger terminals in this manner, Mr. Delano says, would be of great value to the city. At the present time through passengers are subjected to much inconvenience and annoyance by transfering from one depot to another. Moreover, they see the less attractive districts and they carry away a wrong impression of the city.

Mr. Delano estimates the expenses of the work at $75,000,000. The 25 miles of elevated structure necessary, he says, will cost about $12,500,000. Six railway depots will add $3,000,000 to the amount. Straightening the river would entail an expense of $500,000. The cost of the six office buildings would be about $20,000,000. The financial plan suggested by Mr. Delano involves the pooling of all the property involved within the limits of the proposed site. A separate corporation could be formed, which could issue securities to the present owners, and raise the money necessary to carry out the plan.

Upon an invitation from the Citizens' Club, Mr. Delano, at a recent meeting, presented to the members of the club the more salient features of the proposition. Mr. Isham Randolph, engineer of the Sanitary District, in the discussion which followed, said the scheme would certainly unravel the complication of tracks, which he admitted he had helped to create several years ago. In speaking of the difficulties that would be encountered in persuading the railroads to adopt the plan, he called attention to the fact that the elaborately planned clearing yards for the railways, built several years ago, was lying almost unused, because the separate railway companies felt that in using it they would give up some advantage which they at present have over the other roads. Mr. Louis A. Seeberger called attention to some of the features involving the consideration of real estate. He said that the railway companies, in attempting to do business at the very doors of the jobbing houses, were occupying with their depots and terminals real estate worth per square foot several times that of the site of the proposed terminal. Mr. Dwight H. Perkins offered to Mr. Delano's idea the objection that it did not contemplate connection with deep water. The boats carrying freight on the lakes, he thought, in the future would be built so large as not to be navigable in the Chicago river.

BUSINESS NOTES.

The Morse Chain Co., Trumansburg, N. Y., will erect a new plant in Ithaca during the coming year. Engines and boilers have been bought.

The firm of A. L. Ide & Sons announce that they have established a New York office at 11 Broadway, through which all export, New England and Middle States business will be transacted hereafter, the management being entrusted to J. G. Robertson.

The Chicago branch of the Thompson-Starrett Co. has recently been awarded a contract aggregating about $3,000,000, for a large group of new buildings for the Sears-Roebuck Co., Kedzie Ave., Chicago. The buildings will be of mill construction and also of fireproof brick and terra cotta construction. The largest is a 310x450-ft., 9-story warehouse, with a 100x240-ft. center court covered with a glass skylight. There is a 150x400-ft. 4-story administration building, a clubhouse employees, a 75x200-ft. power house with bine steam engines and two 115x700-ft tory storage buildings. A water tower 50 square and 200 ft. high will afford fire tection for the plant. Besides this work Thompson-Starrett Co. is now handling m its Chicago office the 17-story Rocke-ler Bldg., in Cleveland; the 18-story Hey-rth Bldg., and the Thomas Orchestra Hall Chicago; and the Union Bank Bldg., in innipeg, Can.

The American Bridge Co., 100 Broadway, w York, reports bridge and structural work ry quiet and new contracts scarce, although uch important railroad work is known to be ady for contracts as soon as authorized by e finance departments. The company's ops are busy completing orders and executg miscellaneous current work of minor tonge importance, and are preparing for a umber of general contracts with large railad systems. Among the most important of he latter is one for 15,000 tons of bridge ork to be delivered during 1905, at New rleans and Chicago, for the Southern Pacific, nion Pacific, Chicago & Alton, Oregon & Calornia railroads, the Oregon Short Line and he Oregon Railway & Navigation Co. All of his work will probably be placed in the mbridge, Lassig, American and Detroit plants f the company. A contract has been received from the Cincinnati, Hamilton & Dayon R. R., for 4,700 tons, and another from he Indianapolis Southern R. R. for 3,500 tons f plate-girder bridge work, both to be built t the Toledo plant. A contract from the ouisville & Nashville R. R. for a 1,700-ton arehouse has been placed at Ambridge, and ne for 600 tons of single-track truss spans or the Central Vermont R. R., is placed at Pencoyd, with another of 6,000 tons of pinconnected bridges for the Atchison, Topeka & Santa Fe R. R. Contracts have also been received for the 1,500-ton high "Chronicle" ffice building, in San Francisco. The Ambridge shops are building a 6-story 3,500-ton warehouse for Cincinnati, and the Trenton hops are building large Scherzer lift-spans or Boston and New Haven. The Shiffler plant, Pittsburg, is operated on light bridge work, and hurried building work. The shop work has been completed on the Mississippi River bridge at Thebes, and it is expected that the rection will be completed under sub-contract within a few weeks.

The United Coke & Gas Co., New York, announces that the lease of its by-product coke oven business to the Semet-Solvay Co., of Syracuse, N. Y., has terminated. This puts the United Coke & Gas Co. in its former position of exploiting by-product coke ovens of the Otto-Hoffman and United Otto types. The great number of these ovens now in operation or contracted for (2,603 ovens in the United States and Canada) indicates that the by-product recovery in the manufacture of coke is now permanently established. The American Coal Products Co., 17 Battery Place, New York, will continue to act as selling agent for the tar and ammonia produced by both the United-Otto and Semet-Solvay ovens. The board of directors of the United Coke & Gas Co. will be as follows: G. W. Elkins, W. H. Childs, I. D. Fletcher, Stephen Peabody, Albert Strauss, Eversley Childs, S. E. Barrett, Emerson McMillin, R. C. Pruyn, G. D. Widener, Edmund C. Converse, Powell Stackhouse, Dr. F. Schniewind, T. M. Rianhard. The following officers have been elected: G. W. Elkins, chairman; W, H. Childs, president; Dr. F. Schniewind, vice-president; T. M. Rianhard, vice-president and treasurer; E. J. Steer, secretary.

The Hamilton Cataract Power, Light & Traction Co. has recently started the two 5,000-kw. Westinghouse generators in its De Cew Falls power station. Power is supplied from Welland Canal feeders, tapped in about 14 miles above the power station, and at the station the water has a head of 267 ft. The generators are of the two-bearing type, direct-connected to Escher-Wyss water-wheels, and run at a speed of 286 revs. per min. They generate 3-phase current at a frequency of 66 cycles, and a pressure of 2,400 volts. The power is transmitted to the city of Hamilton, Ont., where it is used for lighting, street railway and manufacturing purposes. A reserve steam-driven station is located at Hamilton, which contains two 1,000-kw. Westinghouse generators. The company has two separate three-phase transmission lines to Hamilton, a distance of about 35 miles. The high tension apparatus is designed for a pressure of 40,000 volts, but will be operated for a time at 20,000 volts. Wm. C. Hawkins is general manager of the Hamilton Company, and is also engineer in charge of the installation.

The Power & Speed Controller Co., makers of the variable speed-transmission apparatus illustrated in The Engineering Record of May 7, 1904, have moved from Boston to Watertown, Mass., where their manufacturing will be conducted in works they are now equipping for the purpose. The company's transmission is designed for variations in speed between 1:1 and 1:7½, and a 15-h. p. apparatus gave an efficiency of 80 per cent. with speeds ranging from 129 to 450 r.p.m.

Queen & Co., Inc., of Philadelphia, makers of scientific appliances, have, to meet the increased demands of their business, removed their instrument factory from Filbert St. to the spacious Cornelius Bldg., 817 to 831 Cherry St. This move supplies the greater space and improved facilities required at the present time.

PERSONAL NOTES.

Mr. J. B. Weddell has been reappointed city engineer of Olympia, Wash.

Mr. Alvin Bugbee has been elected superintendent of the Trenton, N. J., water works.

The Connecticut Society of Civil Engineers will hold its annual convention on Feb. 14-15, at New Haven, Conn.

Mr. J. L. Ludlow, M. Am. Soc. C. E., of Winston-Salem, N. C., has been appointed chief of engineers, with the rank of colonel, on the military staff of Governor Glenn, of North Carolina.

Mr. Edgar N. Hannaford has been elected mechanical engineer of the Cincinnati Board of Education; his special work will be in connection with the heating and ventilating of schools.

Mr. C. C. Vermeule has been appointed superintendent of the East Orange, N. J., water works. Mr. Vermeule was consulting engineer for the city during the construction of the works.

The United States Civil Service Commission announces an examination on Feb. 15-16, to secure a list of eligibles from which vacancies in the position of civil engineer, Philippine service, will be filled.

The President has announced his intention to appoint J. Rivers Carter as postmaster at Birmingham, Ala. Mr. Carter is a civil engineer by profession, and a graduate of the University of Pennsylvania.

Mr. Geo. A. Howells, of the Rand Drill Co., New York, was presented with a loving cup by the officials of the company on Jan. 5, the twenty-fifth consecutive anniversary of his connection with the Rand interests.

Mr. C. W. Thorn, who has had charge of the Pennsylvania R. R. improvements in Chester, Pa., has been transferred to Camden, N. J., and will have charge of the improvements the company is carrying on in that city.

Mr. J. P. Johnston has resigned as western sales manager of the Alphons Custodis Chimney Construction Co., and is now connected with the Weber Steel-Concrete Chimney Co., as general sales manager, with offices in Chicago.

Mr. Henry D. Beach has resigned from the general managership of the Pacific Iron Works, of Bridgeport, Conn., to accept the position of chief signal engineer of the New York, New Haven & Hartford R. R., an office he formerly held with that road.

Mr. J. L. Harrington has resigned the position of engineer to the C. W. Hunt Co., West New Brighton, N. Y., and has accepted that of chief engineer of the Locomotive & Machine Company, of Montreal, Canada, where he will have particular charge of bridge and construction work.

Mr. Henry I. Budd, commissioner of roads of New Jersey, died at his home in Mt. Holly, N. J., on Jan. 14. Mr. Holmes was appointed commissioner of roads by Gov. Werts in 1895 and held the office without interruption until the time of his death, more than 1,000 miles of State and county roads being built under his administration.

Henry C. Mortimer, Jr., of the General Electric Inspection Co., has joined the New York office staff of the Crocker-Wheeler Co. He will assist F. B. DeGress, manager of that office, and will succeed A. J. Thompson, who has accepted a position with the New York branch of the Bullock Electric Mfg. Co.

Mr. Edward L. Phillips, president of the Hewes & Phillips Iron Works, of Newark, N. J., died in Chatham, N. J., on Jan. 14. Mr. Phillips was a son of the late John M. Phillips, founder of these works, and was a graduate of Cornell University. He took an active interest in out-door sports and was the designer of water and ice craft and of some mechanical inventions.

Robert Weir, who for many years was consulting engineer of the Union Subway Construction Company, of New York, died suddenly at his home in Montclair, N. J., recently. He was 69 years old. Mr. Weir was born at West Point, N. Y., and was the son of Prof. Robert Walter Weir, of the United States Military Academy. For a number of years he was associated with the construction department of the Croton Water Works.

Mr. Charles G. Williams, of Norwalk, Ohio, died in Phoenix, Ariz., on Jan. 8. Mr. Williams graduated from Massachusetts Institute of Technology in 1895, with the degree of civil engineer, and was connected with the Massachusetts Highway Commission for two years following that time. He was then compelled to go to Arizona for his health, and after a 5-year residence there accepted a position with the reclamation service, U. S. Geological Survey, on the construction of irrigation ditches in the Salt River valley, Ariz., on which work he was employed at the time of his death.

At the meeting this week of the American Society of Heating and Ventilating Engineers the following officers were elected: President, Prof. William Kent, of Syracuse University; first vice-president, Reginald Pelham Bolton, of New York; second vice-president, C. B. J. Snyder, architect of school buildings, Board of Education, New York; secretary, W. M. Mackay, of New York; treasurer, U. G. Scollay, of Brooklyn; board of governors, B. H. Carpenter, of Wilkesbarre, Pa.; B. F. Stangland, of New York; James Mackay, of Chicago; A. B. Franklin, of Boston, and J. C. F. Trachsel, of Philadelphia.

General Lord Kitchener, of Khartoum, commander-in-chief in India, has just entered upon his thirty-fifth year of army service, he having joined the Royal Engineers as a lieutenant on January 4, 1871. He remained exactly twelve years a lieutenant, being promoted to captain on January 4, 1883. From that point his promotion was somewhat rapid, he passing through the ranks of major and lieutenant-colonel to that of colonel in little more than five years, his colonelcy being dated April, 1888. He became major-general in 1896, lieutenant-general in December, 1899, and general in June, 1902. Lord Kitchener is now in his fifty-fifth year.

At a meeting of the original directors of the Hudson Companies, recently incorporated to construct tunnels under the Hudson River, at New York, the following permanent directors were elected: Walter G. Oakman, William G. McAdoo, William Barclay Parsons, John W. Simpson, William C. Lane, Frederick B. Jennings, Anthony N. Bradv, Andrew Freedman, Gardiner M. Lane, Cornelius Vanderbilt, Pliny Fisk and William M. Barnum. The board subsequently organized by electing the following officers: President, Walter G. Oakman; chief engineer, Charles M. Jacobs, deputy chief engineer, J. Vipond Davies; consulting engineer, William Barclay Parsons; treasurer, Henry A. Murray; secretary, Kenyon B. Conger.

A meeting of the engineers of the Hydrographic Branch of the U. S. Geological Survey, east of the Mississippi River, was recently held in Washington, at which the following were in attendance: New England: H. K. Barrows, engineer in charge; S. K. Clapp and F. E. Pressey, assistant engineers. New York and Michigan: R. E. Horton, hydrographer in charge; C. C. Covert, assistant engineer. New Jersey, Pennsylvania, Maryland, Virginia and West Virginia: N. C. Grover, engineer in charge; H. D. Comstock, engineering aid. Southern States: M. R. Hall, hydrographer in charge; J. M. Giles, assistant engineer; W. E. Hall, engineering aid. East Mississippi Valley: E. Johnson, Jr., engineer in charge, F. W. Hanna, assistant engineer. Besides these men, Prof. Thomas U. Taylor, who is carrying on the hydrographic work in Texas, and other engineers who are detailed for work at the Washington office, were also in attendance. The following subjects were discussed: "Winter Records for Current Meter Gaging Stations," "Gages," "The Maintenance of Permanent River Stations," "Effect of Grass on Stream Gagings," "Curves of Mean Velocity and of Area," "Secondary or 'Bench Mark' Stations," "Limits of Accuracy in Reporting Discharge Measurements in Constructing Rating Tables and in Applying Gage Heights," "Methods of Counting Seconds and Revolutions in Making Low Water Measurements," "Bench Marks," "Equipment for Cable Stations," "Cost of Steam Gaging," "The Study of Data by Local Men," "The Work of the Computing Section," "Evaporation," "Hydrographic Gazetteer."

The annual meeting of the Pacific Northwest Society of Engineers was held in the Seattle Chamber of Commerce building, on Januarv 7, 1905, and the following officers were elected for the ensuing year: Frank W. Hibbs, Pres.; James D. Blackwell, 1st Vice-Pres.; T. A. Noble, 2d Vice-Pres.; A. H. Fuller, 3d Vice-Pres.; Milnor Roberts, Sec.; H. W. Scott, Treas.; A. B. Coe, Librarian. Directors, W. D. Barkhuff, C. E. Fowler, J. M. Clapp, I. C. Otis, J. J. Crydeman, W. R. Prowell, J. L. McPherson, E. W. Cummings. After the election of officers, Mr. Francis R. Bates read a paper on "General Notes on Electrical Machine Design."

The engineers of the Reclamation Service recently held their second annual conference, at the Washington, D. C., office of the U. S. Geological Survey, to consider the plans and estimates of large irrigation works in the West. The various subjects discussed, beside those of construction, related to water laws and the distribution of water, alkali and drainage, cement and concrete, measurement of streams, etc. The following members of the Reclamation Service were in attendance: Cyrus C. Babb, District Engineer for Montana; S. K. Baker, Hydrographic Aid, office; H. K. Barrows, Engineer in charge of hydrographic investigations in New England; Morris Bien, Engineer and legal adviser; C. J. Blanchard, Statistician; George H. Bliss, Assistant Engineer, Washington; R. E. Bolster, Assistant Engineer, office; L. V. Branch, Assistant Engineer, North Platte project; W. W. Burnham, Hydrographic Aid, office; F. H. Cass, Traffic Agent; S. K. Clapp, Assistant Engineer, New England; C. C. Covert, Assistant Engineer Hydrography, New York and Michigan; N. H. Darton, Geologist, in charge investigation of underground waters in western section; A. P. Davis, Assistant Chief Engineer; A. L. Fellows, District Engineer for Colorado; J. E. Field, Engineer in charge of North Platte project; Chas. H. Fitch, Chief Auditor of Reclamation Service and Supervising Engineer for South Dakota; Robt. Follansbee, Assistant Engineer, office; M. L. Fuller, Geologist in charge of eastern division of Hydrology; J. M. Giles, Assistant Engineer southern stream measurement; N. C. Grover, charge stream measurement, Washington Dist.; M. R. Hall, charge southern section hydrography; W. E. Hall, Assistant Engineer, southern section hydrography; F. W. Hanns, Assistant Engineer, office; C. F. Harley, Engineering Aid, office; R. W. Hawley, Assistant Engineer, office; L. C. Hill, Supervising Engineer for Arizona; A. H. Horton, Engineer, office; R. E. Horton, charge hydrographic investigations, New York and Michigan; J. C. Hoyt, Computer, stream guaging work; Edw. J. Johnson, Engineer in charge of hydrographic investigations in Mississippi District; A. H. Kastl, Constructing Engineer; M. C. Leighton, Hydrographer in charge of Hydro-economics; S. J. Lewis, Assistant Engineer, office; H. V. Lemenarger, Draftsman, office; J. B. Lippincott, Supervising Engineer for California; I. W. McConnell, Engineer in charge Uncompahgre Valley project; Thos. H. Means, Engineer of Soils, charge of land classification; E. C. Murphy, Engineer, Inspector of stream guaging; F. H. Newell, Chief Engineer; T. A. Noble, District Engineer for Washington; C. R. Olberg, Assistant Engineer, office; H. N. Parker, Assistant Hydrographer, office; E. C. Paul, Engineer, office; E. T. Perkins, Engineer, traveling auditor; F. E. Pressey, Engineer, Assistant New England stream guaging; C. T. Prall, Assistant, Milk River project; J. H. Quinton, Consulting Engineer; G. S. Richardson, Assistant Geologist; D. W. Ross, District Engineer for Idaho; W. H. Sanders, Consulting Engineer; H. N. Savage, Supervising Engineer, Montana and Wyoming; W. W. Schlecht, Assistant Engineer; Chas. S. Slichter, Engineer in charge of investigation of movement of underground waters; Herman Stabler, Engineering aid; W. G. Steward, office; H. A. Storrs, Electrical Engineer, in charge of pumping projects in North Dakota; L. H. Taylor, Supervising Engineer for Nevada; T. U. Taylor, Engineer, stream measurements in Texas; F. H. Tillinghast, Assistant Engineer; R. F. Walter, District Engineer, South Dakota; N. E. Webster, Bookkeeper, Reclamation Service; T. B. White, office.

CONTRACTING NEWS

OF SPECIAL INTEREST TO

CONTRACTORS, BUILDERS, ENGINEERS AND MANUFACTURERS

OF ENGINEERING AND BUILDING SUPPLIES.

WATER.

Notes Arranged Alphabetically by States.

Phoenix, Ariz.—Press reports state that the U. S. Reclamation Service, Washington, D. C., has under consideration a distribution system for the entire Salt River Valley. The present canal system of the Salt River Valley consists of 4 main canals on north side of river, with an aggregate length of about 109 miles and some 300 miles of lateral ditches, and on south side of river of 6 canals with an aggregate length of about 70 miles and several hundred miles of lateral ditches. It was the intention to secure the present canal systems to carry the stored water of Tonto dam, but in order to do this the canals must be under control of the Water Users' Assoc., and arrangements for purchase of the existing systems have not been made, the owners wanting too much for their rights. If such arrangements cannot be made this canal system will be built.

San Francisco, Cal.—The North Side Water is reported incorporated, with a capital of $50,000. Geo. Manuel, of Can Francisco, is one of the incorporators.

Santa Ana, Cal.—Bids will be received Jan. 30 by Edw. Tedford, City Clk., for $100,000 municipal water works bonds.

Orange, Cal.—H. Wyneken, City Clk., writes that it was voted Jan. 7, to issue $50,000 bonds for water works.

**San Bernardino, Cal.*—The Geo. M. Cooley Co. is stated to have secured the contract for about 6 miles of water mains in small sizes of pipe, for $10,938.

Fullerton, Cal.—The Fullerton City Water Co. is reported incorporated, to furnish the city with water. Jas. H. Adams, Thos. W. Phillips, and Jas. R. Martin, of Los Angeles, are reported to be the directors; capital, $100,000.

Denver, Colo.—The stockholders of the Agricultural Ditch Co., at a meeting in the Chamber of Commerce on Jan. 1, decided to construct several reservoirs near Golden within the next 3 years at an expenditure of $25,000.

Cortez, Colo.—W. H. Wigglesworth, of Cortez, Engr. Montezuma Valley Irrig. Dist., writes that it is proposed to construct an irrigation system, to cost $500,000. O. E. Stone, Pres.; G. M. Longenbaugh, Secy.

Montrose, Colo.—The citizens voted Jan. 10, to issue $100,000 bonds for the construction of water works.

Waterbury, Conn.—On recommendation of Mayor Elton and City Engr. Cairns, the Bd. of Pub. Wks. has recommended to the Bd. of Aldermen that the General Assembly be asked to give necessary permission for the issue of $75,000 additional high water service bonds, for the purpose of carrying out the proposed plans for increasing the system.

Rushville., Ind.—It is reported that new wells will probably be driven to secure an increased water supply.

Chrisman, Ill.—Bids will be received by the Mayor and City Council on Feb. 7, for pumping machinery, pipe, hydrants, valves, specials and supplies required for the construction of water works, as advertised in The Engineering Record.

Rockford, Ill.—Local press reports state that Frank J. Phinney, Supt. Water Wks., in his annual report will recommend improvements to water works, including the purchase of a 10,000,000-gal. pumping engine, erection of a power station and the use of motors for pumping on 3 wells now connected with the air lift apparatus at the pumping station.

Cherokee, Ia.—The State Bd. of Control is stated to have decided to extend the pump house and water system at the State Hospital, at a cost of $25,000.

**Independence, Kan.*—Press reports state that Hanley & Ritchie, of Iola, Kan., have secured the contract for constructing water works, for about $93,000. The filter contract is stated to have been awarded to the Roberts Mfg. Co., of Philadelphia, Pa.

Yates Center, Kan.—Burns & McDonnell, Dwight Bldg., Kansas City, Mo., have been selected to prepare surveys, plans and specifications for water works for Yates Center.

Baton Rouge, La.—There will probably be an extension made here of 4 miles of water mains. R. Swart, City Engr.

Lawrence, Mass.—The Council passed an ordinance on Jan. 17 authorizing the Water Comrs. to employ an engineer to make soundings along north bank of Merrimack River, in order to obtain an increase of the water supply by driven wells. M. T. Collins, Supt. Water Wks.

Agawam, Mass.—The Com. on Water Supply is stated to have reported to the town meeting on Jan. 7 that the authorities of West Springfield would rent water to Agawam for the Mettineague Dist.; the estimated cost to the town for piping, hydrants, etc., is about $10,000.

At the town meeting Jan. 7 the citizens are reported to have voted to authorize the Selectmen to petition the Legislature for an enabling act regarding the establishing of a water system.

Battle Lake, Minn.—The question of constructing water works is reported under consideration here.

Ellisville, Miss.—W. M. Hardee, City Clk., writes that bids will be received on Feb. 7 for the construction of water works to cost about $20,000. Engineer Wilcox, of Jackson, has prepared the plans.

Poplarville, Miss.—The citizens are reported to have voted on Jan. 13 to issue bonds for the construction of water works.

Kansas City, Mo.—The Bd. of Park Comrs. is stated to have requested the Bd. of Water Comrs. to extend the water mains to Swope Park. S. A. Mitchell, Ch. Engr. Water Wks., will prepare an estimate of cost.

*Everett Elliott, Secy. Bd. Pub. Wks., writes that the Wm. Tod Co., of Youngstown, O., has secured the contract for furnishing and installing a 20,000,000-gal. pumping engine for Turkey Creek pumping station for $114,180. It also submitted a bid of $120,000. Bids were also received from the Allis-Chalmers Co. (4 bids), $93,700, $91,500, $89,700 and $88,600; Camden Iron Wks., $128,500, and Holly Mfg. Co., $148,700.

Glendive, Mont.—H. J. Halvorsen, City Clk., writes that it was voted Jan. 7 to issue $50,000 bonds for the construction of water works.

Ft. Keogh, Mont.—It is reported that bids are wanted Feb. 9 for installing water supply system at this post. W. W. Robinson, Jr., Ch. Q. M., St. Paul, Minn.

Havre, Mont.—It is reported that it is proposed to construct a reservoir in the spring with a capacity of 500,000 gal.

**Osceola, Neb.*—Wm. Tunney, of Joliet, Ill., is stated to have secured the contract for constructing the distributing system for the water works. Other portions of the plant will be let at a later date.

Hopewell, N. J.—The Boro. Council is reported to be considering the question of purchasing the plant of the Hopewell Water Co., and enlarging and improving it.

Lumberton, N. J.—It is stated that the Lumberton Light, Water & Sewage Co. will shortly construct water works. Gen. F. Reid and Moses S. Watson, of Lumberton, are reported to be incorporators of the company.

Utica, N. Y.—Wm. S. Bacot, Engr. & Gen. Mgr. Consolidated Water Co., writes that contracts will be let within the next two months for improvements to the water works.

Brooklyn, N. Y.—The following are the bids opened on Jan. 11 by John T. Oakley, Comr. Water Supply, Gas & Electricity, for repairing 10 internally fired Morris boilers at the Ridgewood North Side Pumping Station, Brooklyn Boro. (each bid contains certain modifications): The Franklin Hart, Jr., Co., $23,292; N. Fogarty Bros., $24,530; Edw. Burhorn, $28,704; P. J. Donohue & Son, $29,252; Jas. Riley Repair & Supply Co., $31,989; I. P. Morris & Co., $28,900; A. D. Granger & Co., $24,863; F. MacSwegan & Son, $25,000. and P. Delaney & Co., $33,626.

Bids will be received Feb. 1 by John T. Oakley, Comr. Water Supply, Gas and Electricity, N. Y. City, for hauling and laying water mains and appurtenances.

New York, N. Y.—Wm. H. Burr, Rudolph Hering and John R. Freeman, the special commission engaged by the Bd. of Estimate and Apportionment to report on the condition of the city's water supply, has reported to Mayor McClellan, advocating the immediate expenditure of $4,000,000 for various dam and reservoirs in the Croton watershed, and recourse to Esopus Creek, at an expenditure of $91,000,000.

Buffalo, N. Y.—Accompanying the message to Council of the acting Mayor, was a communication from Francis G. Ward, Comr. of Pub. Wks., in which he recommended that a new inlet be made in Emerald Channel; that a new channel be made connecting the new inlet with a new plant to be located on park lands between Porter Ave. and Jersey St.; that a tunnel be run from the new plant to the present plant at the foot of Massachusetts St.; that the pumping capacity be increased from 187,000,000 to 250,000,000 gal. per day, the new pumps to be placed in the new plant; that the present building at the pumping station be replaced by fireproof structures.

Norwood, O.—Bids will be received Feb. 11, by the Bd. Pub. Service, for furnishing material and extending water mains. J. A. Stewart, City Engr., Rm. 813 Traction Bldg., Cincinnati. E. R. Edwards, Clk.

Mingo Junction, O.—See "Power Plants, Gas and Electricity."

Greensburg, Pa.—The Veteran Water Co., of Greensburg, is reported incorporated, with a capital of $5,000.

**McKeesport, Pa.*—Geo. F. Johnstin, of McKeesport, is stated to have secured the contract for drilling 10 wells for the water works, at $2.20 per ft. for drilling wells and furnishing casing; $3.89 per ft. for laying 20-in. suction pipe; $3 for 8-in. pipe and $[illegible] for manholes; total cost, $3,575.

**Pittsburg, Pa.*—The Pittsburg Meter Co., East Pittsburg, is stated to have secured the contract for supplying the city with 5,000 water meters of various sizes, for $51,532.

Perryopolis, Pa.—A. J. Guiler, Eugene T. Norton and J. L. Kendall are stated to have applied for a charter for the Perryopolis Water Co., with a capital of $50,000, to build a dam in Washington Run on Mr. Guiler's farm in Perry Township and supply water to Perryopolis, Star Junction and Layton, and to the Baltimore & Ohio and Pittsburgh & Lake Erie R. R. Companies.

Harrisburg, Pa.—The White Hall Water Supply Co., of Franklin Township; Trout Run Co., of Logan Township; Barree Co., of Porter Township; Calvin Co., of Union Township; Valley Point Co. and Arydale Co., both of Shirley Township; Greenmount Co., of Henderson Township; Marsh Run Co., of Tuscarora Township; Acker Co., of Howe Township; Nekoda Co., of Greenwood Township; Wheatfield Co., of Wheatfield Township; Iroquois Co., of Miller Township; Oliver Co., of Oliver Township; Longfellow Co., of Bratton Township; Granville Co., of Granville Township; Ryde Co., of Wayne Township; Antis Co., of Antis Township; Clearview Co., of Milford Township. Each of these water supply companies has a capital of $5,000, and the same incorporators are attached to each application, Howard Watkins and Wm. H. Roth, of Philadelphia, and Geo. M. Bunting, of Chester. The attorneys are Hannis, Williams & Bunting, of 526 Drexel Bldg., Philadelphia, who are also the attorneys for the Mountain Water Supply Co., which has increased its capital from $1,000 to $5,000,000.

Three other water supply companies in the same territory have also asked for charters, the Hares Valley Co., of Union Township; the Aughwick Co., of Shirley Township, and the the Jack's Mountain Co., of Brady Township, with $5,000 capital stock for each company, and with Homer Shoemaker, of Harrisburg, and Geo. B. Barnett and E. B. Hartman, Jr., of Harrisburg, as incorporators.

Philadelphia, Pa.—Bids will be received by Peter E. Costello, Dir. Dept. Pub. Wks., on Feb 2, for Contract No. 31 in connection with the improvement, extension and filtration of water supply, which consists of furnishing coal handling machinery and pockets for Lardner's Point Pumping Stations Nos. 2 and 3, as advertised in The Engineering Record.

Providence, R. I.—The City Council Com. on City Engr's. Dept. and the Comr. of Pub. Wks., are reported to be considering the question of constructing another water main from Sockanosset reservoir into the city, as a means of increasing the water pressure available for fire service.

Dillon, S. C.—See "Power Plants, Gas and Electricity."

North Ft. Worth, Tex.—Bids will be received Jan. 24 by L. G. Pritchard, Mayor, for drilling 3 wells for water works at this place. John B. Hawley, Consulting Engr., Ft. Worth.

Olympia, Wash.—This city has in contemplation the construction of municipal water works. J. B. Weddell, City Engr.

Seattle, Wash.—The Pacific Coast Pipe Co., of Seattle, bid on Jan. 7 for laying a water main on Evanston Ave., as follows: 11,965 lin. ft. 8 in. banded wooden pipe, 70 cts. per lin. ft.; 1,480 lin. ft. 2 in. galvanized iron pipe, 34 cts.; 190 lin. ft. 6 in. c. i. pipe for hydrant connections, $1.20 per lin. ft.; 100 lb. castings, 6 cts. per lb.; 24 c. i. valve boxes, ea., $5.50. Also 27 hydrants and 35 gates; total cost, $12,414.

Spokane, Wash.—D. K. McDonald and R. A. Hutchinson are reported to have acquired 1,600 acres of land in the Spokane Valley, and propose constructing an irrigation system, operated by electric pumps.

Madison, Wis.—It is reported that this city has in contemplation the construction of a 1,000,000-gal. reservoir.

Cornwall, Ont.—Geo. S. Jarvis, Town Clk., writes that no water works improvements are contemplated at present.

Brantford, Ont.—H. T. Leonard, City Clk., writes that $50,000 will be expended for water works improvements, the work to be done by the city by day labor.

Magog, Que.—Alfred Tourigny, City Secy.-Treas., writes that it is proposed to construct water works at a cost of $60,000.

SEWERAGE AND SEWAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Havana, Ill.—Bids are wanted Feb. 15 for constructing brick and tile sewers, as advertised in The Engineering Record.

**Terre Haute, Ind.*—N. S. Kidder, City Engr., writes that Roberts & Co. have secured the contract for constructing sewers on S. 1st and S. 3d Sts., and Jesse Robertson, 629 Chestnut St., for a sewer on N. 7th St. (bids opened Jan. 9); total cost, $9,500.

Des Moines, Ia.—Aldermen, members of the Bd. of Pub. Wks. and City Engr. are reported to be discussing the feasibility of turning the Bird's Run overflow into a central sewer to relieve conditions in central and northwest Des Moines; probable cost of the work is $30,000.

**Davenport, Ia.*—Thos. Murray, City Engr., writes that the following are the bids opened on Jan. 2, for constructing a drain in the northern part of the city, to consist of 10,000 lin. ft. 36-in. vitr. block sewer, 7,600 lin. ft. 30-in. and 40 manholes: Peoples Constr. Co., Davenport, $67,408 (awarded contract); Davenport Constr. Co., Davenport, $72,160, and McCarthy Improv. Co., Davenport, $77,495.

Abilene, . Kan.—The City Council has adopted the order providing for a new sewer district in North Abilene, to be known as Sewer Dist. No. 3.

Baton Rouge, La.—About 5 miles of new sewers are reported in contemplation. R. Swart, City Engr.

Baltimore, Md.—See "Paving and Road-making."

Baltimore, Md.—The City Council has passed on final reading the ordinance appropriating $17,000 to construct a sewer in the bed of Howard St., and to connect with the sewer in St. Paul St.

Grand Rapids, Mich.—The Common Council is stated to have on Jan. 9 adopted a resolution in favor of improving the west side ditch with a trunk sewer, pumping station and flood prevention embankment, at a total expenditure of $203,960. W. L. Anderson, City Engr.

Bay City, Mich.—It is stated that bids are wanted Jan. 23 for constructing a 26x39-in. egg shaped main brick sewer in Belinda St. M. J. O'Malley, Chm. Bd. Pub. Wks.

Lansing, Mich.—Bids will be received by the City Clk. on Jan. 30 for constructing sewers in Pine, Madison and other streets, in all about 5,098 ft. 20x30-in. to 42x63-in.

Kansas City, Mo.—E. A. Harper, of the City Engr's Dept., is reported to have prepared plans for the enlargement and extension of the sewerage system, as follows: To carry drainage of Turkey creek and O. K. creek valleys through the West Bottoms to Missouri river, $850,000; other incidental improvements in this watershed, $250,000; drainage of the Brush creek valley, including $117,000 for the Harris branch, $263,000; Gooseneck creek watershed, $69,123, and drainage of the Blue river valley from Brush creek to the Missouri, $52,577; total, $1,484,690.

South St. Joseph, Mo.—Wm. H. Floyd, Jr., City Engr. of St. Joseph, is preparing plans for sewers for South St. Joseph, and bids will probably be called for in the spring; bids will be asked on concrete and brick; appropriation, $75,000.

Kirkwood, Mo.—The question of disposing of the sewage of Kirkwood is reported under consideration. Chas. G. Recker, Mayor.

South Omaha, Neb.—The Council is stated to have authorized Andrew Rosewater, City Engr. of Omaha, to prepare plans, specifications and estimates for a complete system of storm and satitary sewers for South Omaha; probable cost of the work reported to be about $250,000.

Newton, N. J.—The Bd. of Trade is reported interested in the construction of a sewerage system.

Rochester, N. Y.—See "Street Cleaning and Garbage Disposal."

New York, N. Y.—Bids will be received Jan. 24, by Louis F. Haffen, Pres. Boro. Brox, for constructing sewers and appurtenances in portions of 5 streets. Engineer's estimate: 7,413 lin. ft .12, 15 and 18-in. pipe sewer, 356 lin. ft. 4 ft. 9 in., 303 lin. ft. 4 ft. 6 in., and 371 lin. ft. 4-ft. brick sewer, 89 manholes, 15 receiving basins, etc.

New Rochelle, N. Y.—Bids will be received until Feb. 15 by the Bd. of Sewer Comrs. (Geo. W. Sutton, Chmn.) for constructing approximately 1,875 ft. of 30-in. submerged c. i. pipe sewer under the waters of an arm of Echo Bay. The work also includes the construction of a sand catcher, rising well and other appurtenances. Jas. Knapp Wilkes, Engr.

Buffalo, N. Y.—Bids will be received Jan. 25 by the Dept. Pub. Wks. for constructing 10, 12, 15, 18, 20 and 24 in. tile sewers in portions of Garvey St., Lincoln Parkway, Doyle and Sheffield Aves. Francis G. Ward, Comr.

St. Bernard, O.—Bids will be received Feb. 3 by Geo. Meyer, Village Clk., for furnishing material and constructing sewers in portions of Leonard Ave., Albert and Bertus Sts. J. A. Stewart, Village Engr., Traction Bldg., Cincinnati.

Bids will be received Feb. 16 by Geo. Meyer, Village Clk., for furnishing material and constructing sewers in portions of Ross, Tower, Cleveland, McClelland and Beecher Aves.

Toledo, O.—Local press reports state that the following are the bids opened on Jan. 12 by the Bd. of Pub. Service for constructing sewer No. 937 in Southeast Toledo; O'Neill & Tansey, $104,015; O'Sullivan, Streicher & McKinney, $110,012, and Bodette & Sheehan, $110,864.

Altoona, Pa.—Plans are being prepared for a sewerage system for a portion of the Borough of Millville, lying west of the 9th war of the city of Altoona, which has been annexed to this city. Harvey Linton, City Engr

Lake Preston, S. D.—The question of constructing a sewerage system is reported unde consideration here.

BRIDGES.

Notes Arranged Alphabetically by States.

Stockton, Cal.—It is stated that bids wil be received Feb. 7 by the Bd. Supervs., fo constructing a steel bridge at New Hop Landing.

Hartford, Conn.—The Board of Stree Comrs. are considering and will probabl build next spring two bridges on Alban Ave—one a stone arch over Woods River, estimated cost $20,000; the other a stee bridge over tracks of Central New Englan R. R., estimated cast $30,000, includin grading.

Macon, Ga.—The Central of Georgia Ry. C (H. M. Steele, Ch. Engr., Savannah) will construct a bridge at Walnut St.

Indianapolis, Ind.—H. Klausmann, C Surveyor, writes that bids will be receive on Feb. 7 for the construction of a brid across White River at River Ave., to co $165,000.

Items marked thus give the names of parties awarded contracts.

Vincennes, Ind.—It is reported that bids ill be received Feb. 8 by the Bd. Comrs. of nox Co. for constructing an 80-ft. truss ridge, on concrete abutments.

Des Moines, Ia.—Bids will be received an. 31 by the Bd. Pub. Wks. for filling aproaches to Southeast 6th St. bridge; requirng about 16,577 cu. yd. embankment at orth approach, and 1,664 cu. yd. at south pproach to said bridge. W. W. Wise, Chmn.

Leavenworth, Kan.—See "Miscellaneous."

**Topeka, Kan.*—The Topeka Bridge and ron Co., of Topeka, are stated to have reeived the contract for constructing a bridge 20 ft. in length, with a roadway 18 ft. wide, t Sardou Ave. Other bids received by the ounty Comrs. on Jan 9th were as follows: ohn Gilligan, $15,692; C. G. Seely, $15,996; Midland Bridge Co., $15,900; Canto Bridge o., $14.880; Leavenworth Bridge Co., $14,-60; Dildine Bridge Co., $14,998; J. W. Towle, $16,583; American Bridge Co., $16,-40; Clinton Bridge Co., $14,974; Missouri Valley Bridge Co., $16,945; Pan-American Bridge Co., $19,220, and the Wisconsin Bridge Co., $17,950.

Springfield, Mass.—The County Comrs. are stated to have received the following bids on Jan. 11, for constructing piers and abutments of a bridge over Connecticut River, to connect Springfield with Chicopee: Rivers & Young, of Holyoke, $23,384; Henry L. Norton, of Springfield, $29,296; Norcross Bros., of Worcester, $31,349; A. H. Wright, 77 Alexander St., $32,712; Geo. M. Atkins Co., of Palmer, $32,779; Springfield Constr. Co., $35,077; John Donahue, $37,278; United Constr. Co., $37,421.

Boston, Mass.—Bids will be received Jan. 24 by the Cambridge Bridge Comn. at Mayor's office, City Hall, for furnishing curbstone for Cambridge bridge. Patrick A. Collins, Chmn.

**Minneapolis, Minn.*—Thos. Green, of Minneapolis, Ch. Engr. Minneapolis, St. Paul & Sault Ste. Marie R. R. Co., writes that contracts have been awarded as follows for constructing a bridge across Mississippi River at Minneapolis: To Newman & Hay, of St. Paul, for the concrete piers, and to the Minneapolis Steel & Machine Co., of Minneapolis, for six 110-ft. lattice girders, and one 126-ft. lattice girder; total cost, $55,000.

Helena, Mont.—Bids will be received Feb. 2 by the Bd. Co. Comrs., for constructing 5 steel highway bridges in Prickley Pear canyon, near line of Montana Central Ry. Percy R. Witmer, Co. Clk.

Newark, N. J.—See "Railroads."

**Cold Spring, N. Y.*—Winslow M. Mead, Dept. Supt. State Pub. Wks., writes that the contract for constructing a bridge over Seneca River (Oswego Canal) between the towns of Lysander and Salina, at Cold Spring (bids opened Dec. 27) has been awarded to The King Bridge Co., of New York, for $18,431. For detailed bids received for this work, see issue of The Engineering Record, Jan. 7.

Binghamton, N. Y.—Bids will be received Feb. 7 (readvertisement) by D. C. Herrick, City Clk., for repairing Tompkins St. bridge. A. H. Sutermeister, Engr., Albany.

New York, N. Y.—The following are the bids opened on Dec. 22 by Geo. E. Best, Comr. of Bridges, for the construction of the anchorages in Boroughs of Manhattan and Brooklyn for Manhattan Bridge No. 3 over the East River:

Manhattan Anchorage.

Contractors.	Lump sum		Unit prices.			
	Manhattan anchorage.	Both anchorages.	37,900 cu. yd., of excav.	27,000 lin. ft. piles.	33,320 cu. yd. concrete No. 1.	55,320 cu. yd. Cyclop'n mas'ry.
Engineer's estimate	$1,407,000	....	.....	.....	.....	.....
Williams Eng. Co.	1,197,000	$1,197,000	$3.00	$0.40	$7.00	$8.00
Naughton & Co.	1,296,150	1,296,150	1.95	.22	6.30	5.50
R. H. Hood Co.	1,587,460	1,687,460	2.00	.25	8.00	8.00
J. C. Rogers	1,409,000	....	3.00	.20	6.00	6.00
J. J. Hopper	1,396,140	1,396,140	4.45	.35	10.00	8.00

Brooklyn Anchorage.

Contractors.	Brooklyn archorage.	Both anchorages.	38,800 cu. yd., of excav.	109,100 lin. ft. piles.	33,000 cu. yd. concrete No. 1.	55,485 cu. yd. Cyclop'n mas'ry.
Engineer's estimate	$1,373,000	....	.....	.....	.....	.....
Williams Eng. Co.	1,237,000	$1,237,000	$3.00	$0.40	$7.00	$8,00
Naughton & Co.	1,282,900	1,282,900	1.95	.32	6.30	5.50
R. H. Hood Co.	1,511,884	1,611,884	2.00	.25	8.00	8.00
Ryan & Parker Co.	1,393,000	....	2.25	.20	6.00	6.00
J. J. Hopper	1,337,848	1,337,848	2.00	.10	10.00	8.00
Kosmos Eng. Co.	1,212,554	....	2.00	.50	7.00	6.00

Sherbrooke, N. D.—Bids will be received until Feb. 13 by the Co. Comrs. for repairing 2 old and constructing 10 new bridges in Steele County. S. McPherson, Co. Aud.

Casselton, N. D.—It is stated that the Bd. of County Comrs. will soon let the contract for constructing a steel bridge at Casselton.

Columbus, O.—Bids will be received Feb. 16 by the Bd. Co. Comrs., for furnishing material and constructing substructure, superstructure, approaches and concrete arch roadway; also paving of Hubbard Road bridge over the P., C., C. & St. L. Ry., in Prairie Township. L. E. Jones, Co. Aud.

Dayton, O.—The following are the bids opened on Jan. 6 by the Bd. of Pub. Service, for constructing the superstructure of a bridge across Great Miami River at Herman Ave;—(*a*) for superstructure with plank flooring, (*b*) for superstructure with paved roadway and sidewalks, (*c*) for superstructure using creosoted block (*d*) for re-erecting old bridge. Some of the bidders submitted several bids on different plans: The bridge will have 3 spans, 134 ft. each, one span 190 ft., and one 150 ft.; width of roadway, 20 ft., with 2 sidewalks each 6 ft. (F. M. Turner, City Engr.): J. C. Morrison, Dayton, *a* (2 bids) $29,960 and $31,565; *b* (12 bids) ranging from $31,565 to $49,000; *d* $10,800. The King Bridge Co., Cleveland, *a* (2 bids) $16,300 and $39,060; *b* (4 bids) ranging from $45,260 to $56,350. New Castle Bridge Co., Indianapolis, Ind., *a* (4 bids) $26,800 to $32,900; *b* (8 bids), $35,603 to $51,100; *d* $17,900. Brookville Bridge Wks., Brookville, O., *a* (2 bids), $21.750 and $19,400; *b* (4 bids), $23,400 to $29,200. The Central Constr. Co., Medina, O., *d* $21,148. Joliet Bridge & Iron Co., Joliet, Ill., *a* $26,274; *b* $45,860. Riverside Bridge Co., Wheeling, W. Va., *a* $27,630. Oregonia Bridge Co., Lebanon, O., *a* $29,995; *b* (3 bids) $46,270, $47,900 and $55,600. Massillon Bridge Co., Toledo, *a* $31,500; *b* $46,000; *c* $35,000. Virginia Bridge & Iron Co., Cincinnati, *a* $32,000; *b* $46,000. West Virginia Bridge & Constr. Co., Wheeling, W. Va., *a* $33,000; *b* (2 bids) $44,500 and $49,500. Mt. Vernon Bridge Co., Columbus, *a* $33,000; *b* $52,000. E. J. Lander, Canton, *a* $31,585; *b* (10 bids) ranging from $36,085 to $43,100. Huston & Cleveland, Columbus *a* $33,390; *b* (2 bids), $47,270 and $53,720; *c* $38,220. John P. Cowing, Cleveland, *a* $34,963; *b* $56,554. The Variety Iron Mfg. Co., Cleveland, *a* $41,231; *b* $53,220. The Canton Bridge Co., Canton, *a* $44,232; *b* $56,000 Fridstein & Fridstein, Chicago, Ill., *a* $45,850; *b* $54,020. The Champion Bridge Co., Columbus, *b* $80,000; *c* $80,000.

Port Clinton, O.—Bids will be received until Feb. 17 by the Co. Comrs. for constructing the superstructure of an iron or steel bridge, 225 ft. long and 16-ft. roadway, across Portage River on Ryer Road in Harris Township. Bidders may submit plans and specifications with bids, or may bid according to plans and specifications on file. Henry Pafenbach, Co. Aud.

Williamsport, Pa.—J. A. Lasch, Co. Clk., writes in regard to the iron bridge across Lycoming Creek, recently destroyed, that nothing definite has yet been done toward rebuilding as this is a state bridge, and an appeal will have to be made to the state.

Altoona, Pa.—Plans are being prepared by Geo. H. Brown, Asst. Engr. Pennsylvania R. R. Co., Logan House, Altoona, for a steel bridge to be constructed at 7th St., to cost, with approaches, widening, additional land, etc., between $60,000 and $70,000. The City of Altoona, the Pennsylvania R. R. and the City Passenger Ry. Co., will share the expense. Harvey Linton, City Engr.

Culpeper, Va.—Bids will be received Feb. 20 by A. F. Brown, Co. Surv., for constructing 2 short bedstead spans in Culpeper Co.; also for constructing a 224-ft. steel bridge over Rapidan River between Culpeper and Spottsylvania Co.'s.

Charleston, W. Va.—Bids will be received on Feb. 16, by the City Council (W. A. Hogue, City Engr.) for the construction of a truss bridge across Elk River connecting Charleston and Lovell Sts., as advertised in The Engineering Record.

Madison, Wis.—J. E. Icke, City Engr., is stated to have prepared plans for a concrete steel arch bridge to be constructed at Washing Ave., at an estimated cost of $3,000.

PAVING AND ROADMAKING.

Notes Arranged Alphabetically by States.

**Montgomery, Ala.*—Byron, Suders & Co., of Atlanta, is stated to have received the contract for constructing several miles of sidewalks, for $28,834.

San Francisco, Cal.—The Park Comrs. are stated to have received $20,000 from the Amateur Driving and Athletic Assoc., as a contribution toward constructing an athletic field and speedway at Golden Gate Park.

Sharon, Conn.—Bids will be received Feb. 4 by the Town Bd. of Selectmen for grading 1 section and graveling another section of road in said town. Jas. B. Wilbur, Chmn.

Washington, D. C.—Bids are wanted Feb. 18 for grading 14th St., extended, as advertised in The Engineering Record.

Washington, D. C.—The Senate Com. of the Dist. of Columbia is stated to have reported favorably on bills providing for the extension of Rittenhouse School, T and S Sts. and Rhode Island Ave.; also for widening Bladensburg and Sheriff Roads.

Augusta, Ga.—It is proposed to lay 10,000 sq. yd. of brick paving on 8th St., bet. Broad and Walker Sts., as soon as weather will permit. Nisbet Wingfield, City Engr.

Freeport, Ill.—The Bd. of Local Improv. has passed resolutions providing for the paving of Liberty St. with brick; estimated cost. $46,500. G. W. Graham, City Engr.

**Peoria, Ill.*—R. W. Schuch, Comr. of Pub. Wks., writes that the contract for paving with brick a portion of Glen Oak Ave. (bids opened Jan. 12) has been awarded to Dunbar & McAllister, of Peoria, at $1.35 per sq. yd. for 2,800 sq. yd. brick paving, and 40 cts. per lin. ft. for 2,040 lin. ft. concrete curb.

**Michigan City, Ind.*—The Co. Comrs. have awarded the contract for macadamizing the Roecke Road to J. C. Wilhelm, for $10,475.

Ft. Wayne, Ind.—City Engr. Randall is stated to have completed plans and specifications for paving about 25,842 ft., at a cost of $225,000, for this year.

Franklin, Ind.—Bids are wanted Feb. 7 for constructing 31 miles gravel road in Johnson Co. J. T. Stott, Co. Aud.

Broad Ripple, Ind.—Bids will be received Feb. 7 by the Bd. Town Trus. for improving sidewalks with cement on portions of Shelby. Hancock and North Sts. John O. Brenneman, Clk.

Jeffersonville, Ind.—Victor W. Lyon, City Engr., is preparing plans for paving four blocks on Walnut St. with macadam, vitr. brick gutter, 5 ft. granitoid sidewalks, etc.

Davenport, Ia.—The City Council is stated to have under consideration the paving with asphalt on portions of Pine and 4th Sts., Western and Arlington Aves.

**Atchison, Kan.*—The Co. Comrs. have awarded to Tietge & Douglas, of Atchison, the contract for grading and macadamizing the county road adjoining Atchison, for $2,413.

Baton Rouge, La.—About 5,000 sq. yds. of asphalt or bitulithic is reported in contemplation here. R. Swart, City Engr.

Baltimore, Md.—Bids will be received Jan. 25 by the Bd. of Awards for grading, curbing and paving with Belgian blocks a portion of Smallwood St.; separate bids will also be received on same date for sand, cobble or rubble paving stone and broken stone, vitrified paving blocks, vitrified sewer brick, vitrified sewer pipe, asphalt blocks, American Portland cement, curb stones, gutter stones, flag stones, granite paving blocks, sidewalk and sewer brick for general use in City Engr.'s Dept. during year 1905. B. T. Fendall, City Engr.

Chelsea, Mass.—Mayor Willard in his annual message recommended an expenditure of $40,000 for street improvements. Alfred C. Maggi, City Engr. & Supt. of Sts.

Bay City, Mich.—It is stated that bids will be received Feb. 4 by the Co. Clk., for supplying Bay Co. Road Comn. with crushed stone and gravel for year 1905. J. H. Bloomshield, Engr., Shearer Blk.

Duluth, Minn.—The Bd. of Pub. Wks. is stated to have received the following bids Jan. 7, for paving with macadam on 1st St.: Olson, Johnson & Co., $6,576 and Whitney Bros., N. 1st St., cor. Hughitt Ave., W. S., $5,748.

Webb City, Mo.—Bids will be received by W. E. Smith, City Engr., on Feb. 6 for paving with vitrified brick Allen, Dougherty, Main, Webb and Church Sts., as advertised in The Engineering Record.

**Newark, N. J.*—Jas. Owens, Co. Engr., 196 Market St., writes that contracts for Telford paving on county roads (bids opened Jan. 9) have been awarded as follows: Pier Lane in Caldwell to Francisco Bros, Little Falls, 4,400 cu. yd. excavation, 30 cts. per cu. yd. and 10,660 sq. yd. telford at 50 cts. a sq. yd.; Franklin Ave. in Nutley and Belleville, to Wright & Lindsley of Orange, for 10,000 cu. yd. excav., at 38 cts., and 12,610 sq. yd. telford at 58 cts.; Bradford Ave., in Montclair and Verona, to Osborne & Marsellis Co., Montclair, for 44,700 cu. yd. excav. at 89 cts., and 13,325 sq. yd. telford at 55 cts.; Wall St. and Stuyvesant Ave., in Vailsburg and Irvington, to Ludwig Batt, South Orange, for 20,410 cu. yd. excav. at 25 cts., and 23,540 sq. yd. telford, at 65½ cts.; South Orange Ave. extension, in Livingston, to Wright & Lindsley, for 6,000 cu. yd. excav. at 48 cts., and 8,880 sq. yd. telford at 69 cts.; road to Northfield, in Livingston, to Wright & Lindsley, for 11,440 cu. yd. excav. at 38 cts., and 15,730 sq. yd. telford at 59 cts.; Mt. Pleasant Ave., in West Orange, to Donato Fusco for 28,300 cu. yd. excav. at 72 cts., and 8,880 sq. yd. telford 57 cts.

Jersey City, N. J.—Bids will be received Jan. 23, by the Bd. Street and Water Comrs., for improving portions of Carlton and Mallory Aves.; estimate of quantities: 2,935 cu. yds. earth excav., 3,072 sq. yds. asphalt, 370 sq. yds. Belgian paving, 2,283 lin. ft. curb stone, 4,458 sq. ft. flagging, etc.

Atlantic City, N. J.—Press reports state that the bid of the Cleveland Trinidad Paving Co. to pave Atlantic Ave. with asphalt, at $216,190, was the lowest of the 7 bids opened on Jan. 16. It bid $1.98 per sq. yd. for asphalt, and $1.15 per lin. ft. for curb. The McGovern Constr. Co., of Trenton, submitted the lowest bids for both concrete and granite curb, and the Standard Bitulithic Co., at $2.27 per sq. yd., or a total of $253,000, was the lowest for bitulithic pavement.

Brooklyn, N. Y.—Bids will be received Feb. 1 by Martin W. Littleton, Boro. Pres., for regulating, curbing and laying sidewalks on portions of Ashford and 77th Sts.; for regulating and paving with asphalt on concrete foundation, portions of Bristol and Chestnut Sts. and Park Pl.; also for furnishing material and constructing cement concrete sidewalks on portions of 72d and 92d Sts.; engineer's estimate 2,701 cu. yd. earth excav., 14,505 sq. ft. cement sidewalk, 3,880 lin. ft. new curbstone, 15,460 sq. yd. asphalt, 2,361 cu. yd. concrete, 19,840 sq. ft. cement concrete sidewalk, etc.

Goshen, N. Y.—Bonds amounting to $300,000 are reported sold for improving roads in Orange County.

Freeman, N. Y.—Mayor Block is stated to have recommended in his annual message the paving of Broadway, at a probable cost of $97,000.

Buffalo, N. Y.—Bids will be received Jan. 25, by the Dept. Pub. Wks., for repaving portions of W. Parade Ave., Guthrie Alley and Commercial St., and paving a portion of Champlin St. Francis G. Ward, Comr.

Bids will be received Feb. 1 by the Dept. Pub. Wks., for repaving portions of William, Eagle, Amherst and Park Sts. Francis G. Ward, Comr.

New York, N. Y.—Bids will be received Jan. 24, by Louis F. Haffen, Pres. Boro. Bronx, for regulating, grading, curbing and flagging sidewalks on portions of 5 streets; for paving with asphalt on concrete foundation portions of E. 167th St. and Macy Pl.; also paving with asphalt blocks on concrete foundation, a portion of Crotona Ave.; engineer's estimate, 10,275 cu. yds. earth excav., 23,650 cu. yds. rock excav., 20,975 cu. yds. fill., 9,450 lin. ft. new curb., furnished and set, 37,880 sq. ft. new flagging, furnished and laid, 3,405 sq. yds. asphalt, including binder course, and 5-year maintenance guarantee, 23,250 sq. yds. asphalt block with 5-year maintenance guarantee, 3,600 cu. yds. concrete, including mortar bed, etc.

Albany, N. Y.—The Bd. of Contract and Supply is stated to have rejected all bids received Jan. 3 for furnishing material, grading, curbing, paving with asphalt blocks, repairing sidewalks, constructing receiving basins on a portion of S. Pearl St. According to reports new bids will be received.

The following bids are stated to have been opened Jan. 3 by the Bd. of Contract and Supply for grading, curbing and repaving with granite block on a portion of Dallius St.: Richard B. Rock, $34,400; Lovejoy Granite Co., $35,263; Mulderry Bros., $36,859; Albany Material & Constr. Co., $36,942, and John Doyle, $33,559.

Kingston, N. C.—L. J. Mewborne, Town Clk., writes that it is proposed to soon let a contract for 10,000 sq. yds. of street paving. N. J. Rouse, Mayor.

Cincinnati, O.—Bids will be received Jan. 25 by the Bd. Pub. Service for furnishing material, grading and macadamizing a portion of Carthage Pike. Geo. F. Holmes, Clk.

Columbus, O.—Bids will be received Feb. 17 by the Co. Comrs. for $5,000 E. Broad St. road improvement bonds in Marion and Truro Townships. Jas. A. Lamp, Chmn. Comrs. of E. Broad St. Road Improv.

Toledo, O.—Bids will be received Jan. 26, by the Bd. Pub. Service, for furnishing material and paving with either various kinds of blocks, sheet asphalt, bitulithic pavement or other bituminous macadam, portions of Baker, Wabash and Winthrop Sts. and Lawrence Ave. Harry S. Jones, Secy.

Cleveland, O.—Bids will be received Feb 1 by the Bd. Pub. Service for grading, draining, curbing and paving with brick, portions of numerous streets. A. R. Callow, Secy.

**Philadelphia, Pa.*—Michael O'Rourke, Lehigh Ave. and Aramingo St., is stated to have received the contract for repairing the paved streets during 1905 for $127,000, and E. H. Vare for repairs to county roads during present year, for $120,000.

Meadville, Pa.—The Select Council has passed an ordinance providing for the paving of Park Ave., 3,000 ft., at a cost of about $30,000. W. A. Doane, City Engr.

Port Townsend, Wash.—Bids are wanted Feb. 9 for constructing cement walks, as approaches to buildings at Forts Worden and Casey. Geo. H. Penrose, Q. M., U. S. A.

Seattle, Wash.—The City Council has passed ordinances providing for the grading of Wallingford Ave., at a cost of $51,500, and for a pile bridge roadway on Holgate Ave., at a cost of $13.700.

Mt. Pleasant, Wis.—The macadamizing of 14 miles of roads at a probable cost of $40,000, is reported under consideration.

Madison, Wis.—It is stated that bids will be received Feb. 15 by J. F. Icke, City Engr., for macadamizing various streets; probable cost, $30,000.

POWER PLANTS, GAS AND ELECTRICITY.

Notes Arranged Alphabetically by States.

Rockville, Conn.—Mayor Geo. Forster, in his annual message, is stated to have recommended the municipal ownership of the electric light plant.

Ft. Valley, Ga.—J. L. Fincher, Mayor, writes that it is proposed to construct an electric light plant, at a cost of about $6,000. Contracts will probably be let in April.

Savannah, Ga.—Local press reports state that the Savannah Lumber Co. will install an electric light plant at its mill, and supply power to private residences of the city.

Edwardsville, Ill.—See "Electric Railways."

Lena, Ill.—Benfer Bros., of Winslow, is stated to have petitioned for a franchise for a lighting plant.

Red Bud, Ill.—The Red Bud Light & Power Co., of Red Bud, has been incorporated, with a capital of $20,000, to operate a light, heat and power plant. Incorporators: J. A. Hamilton, A. B. Daab and L. B. Turner, Jr.

Brazil, Ind.—The Brazil Electric Co. is reported to have purchased property on Main St. to be used as a site for a power house to be erected early in the spring.

Terre Haute, Ind.—See "Electric Railways."

Muskogee, Ind. Ter.—C. W. Haskell, Chmn. Com., Commercial Club, writes that it is proposed to develop the water-power of Grand River and construct a power plant, at a probable cost of $800,000. Engineer, D. W. Bolich.

Marshalltown, Ia.—L. Derby, City Clerk, writes that it is proposed to increase the electric light service from 130 to 200 arc lights; probable cost of the work, $8,000.

Items marked thus give the names of parties awarded contracts.

Columbus Junction, Ia.—The question of constructing an electric light plant is reported under consideration here.

Holyoke, Mass.—The Bd. of Aldermen has passed on first reading the ordinance providing for the issue of $73,000 bonds for purchasing land and constructing a gas holder.

Ann Arbor, Mich.—Wm. Goodyear, Chmn. Lighting Com., writes that bids will probably be received about Feb. 1 for lighting the city streets. Ross Granger, City Clk.

Kalamazoo, Mich.—The Kalamazoo Valley Electric Co. is reported reorganized as the Commonwealth Power Co., with a capital of $4,000,000. The intention of the company is to increase its capacity sufficiently to enable it to furnish power for electric roads which will be built between Kalamazoo and Grand Rapids in the near future. Wm. A. Foote, Pres., and C. H. Frisbie, Vice-Pres., both of Jackson, Mich.

Alpena, Mich.—Papers have been filed for the incorporation of the Alpena Light, Heat & Power Co., with capital of $100,000. The company will build a dam to utilize the power of Thunder Bay River to furnish 12,000 h.p. Incorporators: F. W. Gilchrist, P. W. Fletcher, Gen. R. A. Alger and Geo. P. Smith.

Grand Ledge, Mich.—A. E. Dunn, of St. Johns, is stated to have secured a franchise for the construction of a gas plant.

St. Paul, Minn.—Bids will be received Jan. 23, by the Bd. Pub. Wks. for constructing sewers in portions of Palace, Victoria, James and Milton Sts.

Anoka, Minn.—The Anoka Gas Light Co. is reported to have in contemplation improvements, which will cost $20,000.

Duluth, Minn.—Press reports state that amended articles of incorporation of the Great Northern Power Company (C. A. Duncan, Pres., Duluth) which proposes to harness the waters in the northern part of Minnesota for the purpose of furnishing electric power and light to Duluth, Superior and the towns of the iron ranges, have been filed in the office of the clerk of the court here, increasing the amount of the capital from $100,000 to $2,000,000. Chas. D. Barney & Co., bankers, of New York and Philadelphia; Tucker & Co., bankers, of Boston and the Knickerbocker Trust Co. have provided $4,000,000 for the completion of the work. The National Ry. Constr. Co., of Boston, Mass., is reported to have the contract for the development of the power.

Perth Amboy, N. J.—Peter Floersch, Kelly & McAlinden, Sickles Bros. and other merchants of Perth Amboy, are reported interested in the organization of a company to construct an electric light plant.

Atlantic City, N. J.—Bids will be received by Jas. Knox Taylor, Superv. Archt. Treas. Dept., Washington, D. C., on Feb. 3, for the electric lighting and conduits for call bell telephone and clock wiring, etc., for U. S. Post Office at Atlantic City, as advertised in The Engineering Record.

Buffalo, N. Y.—The Bd. of Aldermen on Dec. 16, decided to have Francis G. Ward Comr. of Pub. Wks., to prepare estimates for a municipal lighting plant.

Batavia, N. Y.—The Batavia Light & Power Co., of Batavia, a reorganization of the Consolidated Gas & Electric Co., has been incorporated, with a capital of $100,000. Directors: Seth A. Warren and Geo. R. Howard, of Buffalo, and Barber B. Conable, of Warsaw.

Clinton, N. Y.—H. E. Thomas, Village Clk., writes that it is proposed to construct an electric light plant at a cost of $7,000. This matter has been held up by an injunction, which has just been dissolved, and the village will open bids as soon as the judge signs final order.

**Syracuse, N. Y.*—The following are reported to be the bids opened on Jan. 10, by the Bldg. Com. of the Bd. of Superv., for electric wiring the new court house: Western Electric Co., New York, $29,509 (awarded contract); Harry Alexander, New York, $35,500; Keller-Pike Co., of Philadelphia, Pa., $40,000; Geo. A. Williams & Co., New York, $31,666; Wheeler-Green Electric Co., of Rochester, $38,419; Lord Electric Co., of Boston, Mass., $31,000; Edw. Joy, Syracuse, $41,250, and David Cronin, Syracuse, $29,845.

**Salisbury, N. C.*—The T. A. Gillespie Co., Empire Bldg., New York, N. Y., has secured the contract for constructing the dam and canal on Yadkin River near Salisbury for the Whitney Reduction Co., of New York. The contract price is about $1,500,000.

Asheboro, N. C.—The Asheboro Electric Co., of Asheboro, has been incorporated to erect, own, control and operate an electric plant in Asheboro; capital, $50,000. Incorporators: A. M. Rankin, W. M. C. Hammer, W. J. Miller, and others.

Cincinnati, O.—Bids will be received Jan. 26, by the Bd. Pub. Service, for furnishing material and constructing sewers in a portion of Ahrens St. Geo. F. Holmes, Clk.

Cleveland, O.—Bids will be received Feb. 15 by Chas. Orr, Dir. of Schools, Rose Bldg., for furnishing electric light and power for various schools in City School Dist., during ensuing year.

Mingo Junction, O.—The manager of the Mingo Junction Water Co. writes that the company is now installing a pump, and will later on construct another reservoir, also enlarge the electric light plant, but will not be ready for bids for some time.

Toledo, O.—Bids will be received Jan. 25 by the Bd. Pub. Service for lighting public streets, alleys, squares, avenues, wharves, landing places, public grounds, buildings and other public places in said city with electric lights for a period of not less than 2 nor more than 5 years. Harry S. Jones, Secy.

Dillonvale, O.—The Dillonvale Heat, Light, Power & Water Co. is reported incorporated, with a capital of $50,000, by Wm. B. Dagger, Frank Alexander, W. Cole, and others.

Blackwell, Okla. Ter.—The Union Gas & Oil Co., of Blackwell, has been incorporated with a capital of $200,000. Stockholders: H. Wyman, C. R. Ogg and G. W. Kite, all of Blackwell.

Catasauqua, Pa.—The Lehighton-Northampton Gas & Electric Light Co. is reported to have under consideration the rebuilding of its gas and electric light plants.

**Hanover, Pa.*—J. W. Mumper, of Hanover, is stated to have secured the contract for lighting the borough for 10 years at $64.92 per light for 2,000 c.p. gasoline lights on an all night service.

**Renova, Pa.*—Edwin Bower, Chmn. Police & Light Com., writes that Jos. P. Kane, of Renova, on Jan. 11 secured the contract for lighting the streets at $65 per light per yr. of 2,000 c. p. arc lights; $58 for 1,200 c. p. and $13 for 32 c. p. incandescents. He will commence at once the construction of a plant for municipal and commercial electric lighting.

Dallastown, Pa.—The York & Windsor Gas Co., of Dallastown, is reported incorporated, with a capital of $20,000.

Yoe, Pa.—The Yoe Electric Light Co., of Yoe, is reported incorporated, with a capital of $5,000.

Dillon, S. C.—N. B. Hargrove, City Clk., writes that A. N. Walker is interested in the construction of water works and an electric light plant.

Knoxville, Tenn.—The City Council is reported to be considering the municipal ownership of an electric light plant.

Temple, Tex.—F. D. Lyon, Pres. Texas Gas Co., writes that bids will be received on Feb. 15 for the construction of a gas plant (oil or water gas) with a capacity of 100,000 cu. ft. daily capacity; probable cost $35,000. Engr., R. T. Chase, of Temple.

Wichita Falls, Tex.—The City Council is stated to have granted S. H. Huggins, of Amarillo, a franchise for a hydro-carbon gas plant for the manufacture of gas for illuminating, heating and power purposes; the cost of the plant is estimated at $25,000.

**Burlington, Vt.*—Bellman & Sanford, of New York, N. Y., are stated to have secured the contract for furnishing poles and wires for the municipal electric light plant for $12,600.

Alexandria, Va.—The City Council is reported to have passed a resolution providing for an appropriation of $6,000 for repairs to the gas works.

Grafton, W. Va.—The Grafton Ry. & Light Co., of Grafton, is reported incorporated, to construct and operate an electric railway and electric light and power plant in Grafton. Capital $400,000.

Wausau, Wis.—The Wausau Gas Light & Coke Co. is stated to have decided to make improvements to its plant at a cost of about $75,000. D. L. Plumer, Pres.

Ladysmith, Wis.—J. B. Hawkins, of Eau Claire, is stated to have petitioned for a franchise for an electric light plant.

Marinette, Wis.—It is stated that the Marinette & Menominee Light & Traction Co. will rebuild its gas plant in Marinette, at a cost of $50,000.

**Rhinelander, Wis.*—P. B. Faragher, of Cleveland, O., is stated to have secured the contract to construct a dam and power house at Hat Rapids for the Rhinelander Power Co., for $26,650.

St. Thomas, Ont.—Bids will be received Feb. 15 by S. O. Perry, City Treas., for $200,000 gas and electric light bonds.

ELECTRIC RAILWAYS.

Notes Arranged Alphabetically by States.

Jasper, Ark.—The North Arkansas Electric R. R. & Power Co., of Jasper, has filed a certificate with the Secretary of State providing for the extension of its line from Mt. Hersey, up Buffalo River to its headwaters, thence down the Mulberry and by Ozark to the Arkansas River, thence to Ft. Smith, a distance of 140 miles; also that the capital stock be increased from $150,000 to $4,000,000. A. W. Bates was elected chief engineer. S. J. Norman is the principal promoter.

Los Angeles, Cal.—Land in the San Fernando Valley has been purchased by a syndicate headed by Henry E. Huntington, Pres. of the Pacific Electric Ry. Co., who plans an extension of his electric lines to the property. Others interested are Harrison Gray Otis, W. G. Kerckoff, and others, of Los Angeles.

Oakland, Cal.—The City Council has passed an ordinance granting a franchise to the Oakland Traction Consolidated Co., to construct and operate a street railway line on B'way to the Claremont County Club, at B'way and College Ave.

San Diego, Cal.—Bids will be received Feb. 23 by the City Council, for a street railway franchise on D and State Sts. H. W. Vincent, City Clk.

Los Angeles, Cal.—Bids are wanted Feb. 6, for a street railway franchise on 6th St. H. J. Lelande, City Clk.

Eureka, Cal.—J. E. Green and J. M. O'Brien, of San Francisco, were here recently in company with G. H. Fairchild and Randall Ellis, electric experts and engineers, and are stated to have decided to submit to Council an application for a franchise over 7 miles of the city's streets.

Chicago, Ill.—The City Council has passed the ordinance authorizing an extension of Northwestern Elevated to Ravenswood.

Edwardsville, Ill.—The McKinley syndicate, controlling and operating the interurban electric lines of the Illinois Central Traction Co., the St. Louis & Springfield Electric Ry. Co., and the St. Louis & Northeastern Ry. Co., has purchased the power plant of the Edwardsville Light & Power Co. It is stated that the company will enlarge the plant and install machinery which will provide for the municipal and commercial light and power currents, and power for the operation of the electric cars on the divisions north and south from Edwardsville. In addition, the company will ask a franchise for gas and heating plants.

East St. Louis, Ill—The Troy & Suburban Ry. Co., of East St. Louis, has been incorporated with a capital of $50,000, to construct a line from Troy to Maryville. Incorporators: L. C. Haynes and T. W. Gregory, of East St. Louis; Jas. A. Farmer, of Belleville, and others.

Terre Haute, Ind.—The Terre Haute & Indiana Southern Ry. Co. has been incorporated, with a capital of $1,500,000, to construct street railways in and connecting Terre Haute, Young's, Pimento, Farmersburg, Shelburn, Hymera, Duger, Anteoch, Cass, Farmersworth, Jacksonville, Linton and Coalmount, and to distribute and supply electricity. Wm. H. Schott, Job Freeman, W. H. Crowder are among the incorporators.

Peru, Ind.—The Central Electric Traction Ry. Co., of Indiana, has been incorporated, with a capital of $25,000, to build and operate an electric railway through Peru and Rochester and the counties of Miami, Fulton, Marshall and St. Joseph. J. O. Cole, Jerome Herff and H. F. Masters are the incorporators.

Huntington, Ind.—The Comrs. of Huntington County have granted a franchise to the Inter-State Interurban Co., which proposes to build a line to connect Marion, Ind., and Lima, O.

Portland, Ind.—The Indianapolis, Hartford & Celina Traction Co. has filed a petition with the Co. Comrs. for a franchise to construct an interurban railway through the county, touching Pennville. The line is to run from Indianapolis, through Alexandria and Hartford City to Celina, O.

Des Moines, Ia.—W. S. Porter, of Eldora, Ia., one of the promoters of an electric line to connect Eldora and Des Moines, and also an incorporator of the company organized to construct such line, known as the Des Moines & Eldora Electric Ry. Co., was in this city recently, making arrangements for financing the project.

Capitalists of Des Moines and Sioux City are now figuring on the construction of an electric railway from Sioux City in a southeasterly direction to Audubon, where connection will be made with the proposed line from Des Moines via Audubon to Shelby. I. M. Earle, of the Bankers' Life Assoc., is one of the Des Moines parties now agitating the construction of the Des Moines-Sioux City line.

Des Moines, Ia.—F. S. Mordaunt, promoter of the St. Joseph, Albany & Des Moines Electric Ry., will probably let contracts for grading in February or March. He expects to have specifications and plans ready for the grading contractors to figure on some time during January.

Arkansas City, Kan.—The stockholders of the Kansas & Oklahoma Interurban Ry., has elected W. C. Robinson, of Winfield, President, and L. P. H. Northrup, of Arkansas City, Vice-President and Gen. Mgr. Work of construction will begin at once.

Versailles, Ky.—J. H. Fertig and W. E. Fertig, of Titusville, Pa., and Harold C. Beaty, of Lexington, who are associated with Clifford D. Bebee, of Syracuse, N. Y., the purchaser of the assets of the Bluegrass Consolidated Traction Co., are in Versailles seeking to have the Fiscal Court of Woodford County and the City Council of Versailles grant them franchises to build an electric railway through this county and city that is to run from Lexington to Frankfort.

Detroit, Mich.—The Detroit & Bay City Traction Co. has filed with the Railroad Comr. a map showing the route of the proposed electric railway from Detroit to Bay City. It will go through Pontiac, Lapeer, Caro, Akron and smaller villages.

Benton Harbor, Mich.—Application has been received by the Com. of Railroads from the St. Joe River Traction Co., for the approval of crossings of its proposed line with the Pere Marquette R. R. near Benton Harbor, and with the Big Four Ry. at Eau Claire. It is the intention of this company to build a line from Benton Harbor to Eau Claire, with branches from that point to Niles and Dowagiac.

South Haven, Mich.—A new franchise for an electric railway has been granted to C. W. Williams, of South Haven; Geo. Bardeen, of Otsego, and S. J. Dunkley, of Kalamazoo. Extensions will be made to Kalamazoo and Saugatuck, which will give South Haven a direct line with Detroit and Grand Rapids.

Glendive, Mont.—The Comrs. of Dawson County have granted a franchise to H. J. Haskell, E. S. Baer, B. S. Adams, and others, petitioners for the Glendive & Yellowstone Valley Rapid Transit Co., to build an electric railway and telephone line from Glendive to a point on Missouri River opposite Buford, N. D., a distance of 80 miles.

Lincoln, Neb.—Business men of Lincoln have completed the organization of the Citizens' Ry. Co.; capital stock, $1,000,000. Stockholders: Alex. Berger, F. W. Levering, C. G. Crittenden, Louis E. Wettling, and others.

Concord, N. H.—The Derry & Manchester R. R. Co. is about to present to legislature a petition for a charter. W. M. Parker, Col. W. J. Holt, Noah S. Clark and others, of Manchester, and C. N. Greenough, of Derry, are the incorporators. It is proposed to build a road from a point on Broadway, near the Post Office at West Derry, to some point in Goff's Falls, Manchester.

Camden, N. J.—Charter papers of the New York-Philadelphia Co. have been filed with the Co. Clk., in Camden. The new company has a capital of $4,000,000, and the stock is held in Philadelphia, New Jersey and in New York. Incorporators: A. N. Chandler, of A. N. Chandler & Company, bankers, and H. D. Long, of Philadelphia, and Norman Grey, counsel for the Corporation Co., of Camden. It is the intention of the new company to operate the electric lines composing the present system between Camden and Jersey City. They will be consolidated under one corporation, controlled by the New York-Philadelphia Company.

Syracuse, N. Y.—It is reported that the Syracuse & Suburban Ry. Co. will begin work on an extension to Canastota very shortly. A railway is also reported in contemplation to Pompey and Fabius, to connect with the Syracuse & Suburban.

It is the plan of the new owners of the Syracuse, Lakeside & Baldwinsville Ry. Co. to build an extension to Oswego.

Akron, O.—Surveys have been completed for a line from Akron to Medina by way of Wadsworth. It is stated that C. W. Paget, a New York banker, is head of the syndicate which proposes to build the line.

Cincinnati, O.—The proposed elevated road between Cincinnati and Norwood will be operated by electricity within the corporation limits. J. G. Schmidlapp, one of the promoters of the new enterprise, is authority for this statement. At the annual meeting of the directors, recently, in the office of J. G. Schmidlapp, Union Savings Bank & Trust Co., all of the old officers were re-elected.

Sandusky, O.—It is reported that W. N. Coler & Co., of New York, N. Y., bankers, who own the Jackson City St. Ry. and several other interurban lines in Southern Michigan, and the Gay Bros., investment brokers, of Boston, Mass., are negotiating with F. O. Oleson, looking to the financing of the Sandusky Southwestern Traction Co., now in the hands of a receiver.

Uhrichsville, O.—Edw. Hobson, of Flushing, O., one of the chief promoters of the proposed line which is to connect Canton with Wheeling, states that work is now progressing in the securing of franchises and rights of way. The line will connect with the Canton-New Philadelphia system at Uhrichsville and will parallel the Baltimore & Ohio, touching Stillwater, Freeport, Tippecanoe, Holloway, Flushing and Barton, connecting at the latter point with the new line of the Wheeling Traction Co.

Toledo, O.—The Co. Comrs. are reported t be considering two applications for franchise over the same route from the city limits t the county line along Ottawa Park. Th applicants are the Toledo Interurban Co which is seeking an entrance to the city fo the new Toledo & Ann Arbor line, while th other is John Kumler.

The Toledo, Ann Arbor & Detroit Ry which proposes to build from Toledo to Ann Arbor, is reported as having plans and specifications prepared by the Westinghouse Electric & Mfg. Co. for the complete electrica equipment. It is understood that construction work will start in the spring.

Ottawa, O.—The village has granted franchise to Jos. Mayer and others intereste in the Lima Ry., Light & Power Co., who propose to build a line from Lima to Ottawa, an possibly to Toledo. The village of Columbu Grove has granted a similar franchise.

Lima, O.—The syndicate headed by Jos. Mayer, of Buffalo, which owns the local electric railway system, is securing right of wa for an interurban line north from this cit Franchises have been secured in Cair Ottawa, Columbus Grove and Leipsic, and th road will be extended to Toledo.

Springfield, O.—The Springfield, Troy Piqua Traction Co. has completed surveys f a branch line to St. Paris, and this will probably be built next summer. It is the intentio to extend either to Piqua or to Sidney, placing the road in a good route for through business from Springfield to Toledo.

Bowling Green, O.—The directors of t Lake Erie, Bowling Green & Napoleon R have elected W. M. Tuller, Pres. and C. Draper, Secy.-Treas. As soon as the ne extension to Woodville is completed, an extension to Weston will be built.

Springfield, O.—The Springfield Ry. Co. planning to build 2 miles of new line ne spring, being extensions of the West Pleasa St. line and the Columbus Ave. line.

Beaver, Pa.—The Beaver Valley Tracti Co. has applied for a franchise to build extension of its lines from Vanport to Smith Ferry, where a connection will be made wi the United Power Company's lines. The distance is less than 15 miles.

Frackville, Pa.—The Frackville Borou Council has granted the Pottsville & Tamaq Co. a franchise.

Items marked thus give the names of parties awarded contracts.

**Philadelphia, Pa.*—McGaw & Gray, Pennsylvania Bldg., have secured the contract for the construction of foundations for the Philadelphia Rapid Transit Companys' West Philadelphia elevated line, between the Schuylkill River and 42d St.

York, Pa.—The Hanover & McSherrystown St. Ry. Company's lines, now practically under the control of the York County Traction Company's board of management, are to be extended in Hanover, McSherrystown, Abbottstown, as well as other suburban towns to Hanover, and a new line from Hanover to Littlestown.

West Chester, Pa.—Contractor T. E. O'Connell has been granted a charter for an electric railway from Avondale to Oxford, via Chatham. He will begin work in the early spring. Following this he will build a line from Oxford to Parkesburg. The last survey has been made for the new line from Lancaster to Coatesville via the Pequea Valley and the towns of Bird-in-Hand, White Horse, Compassville and Wagontown, the total distance being 29 miles. The line from Avondale to Oxford will be known as the Oxford, West Grove & Avondale, and will connect with the Kennett-Wilmington line at Avondale.

Mahanoy City, Pa.—A charter has been granted to the proposed Mahanoy City & Tamaqua St. Ry. Co. Construction will begin in the spring.

Pottsville, Pa.—The stockholders of the seven allied corporations of the Pottsville Union Traction Co. have elected C. P. King, of Philadelphia, Pres., and have decided to build extensions from St. Clair to Frackville and Shenandoah, and from Middleport to Tamaqua in the spring.

Pottstown, Pa.—The Pottstown Passenger Ry. is reported to have been leased to the Pottstown & Reading St. Ry. Co., and will be connected with Reading, a distance of 16 miles, in the spring.

Union, S. C.—The City Council has granted a franchise for a street railway to L. G. Young and his associates.

Nashville, Tenn.—Local capitalists have purchased the rights, privileges and franchises of the Nashville & Columbia and Nashville & Galatin Interurban Rys. These roads, which will be electric, will extend from Gallatin, Tenn., through Nashville to Mt. Pleasant, Tenn., a distance of about 75 miles.

Chattanooga, Tenn.—Application will be made at once under the laws of Georgia for a charter for the Tennessee-Georgia Interurban R. R. Co., with a capital of $300,000. The company will be formed to construct and operate an electric railway between Chattanooga and Ducktown, Tenn., via Ringgold, Catoosa and other nearby Georgia points. S. W. Divine, of Chattanooga, is one of the incorporators.

Davenport, Wash.—The City Council has granted a franchise to the Adams County Electric Railroad & Transit Co., to run its line through the town.

Walla Walla, Wash.—The Co. Comrs. have granted Wm. S. Isaacs a franchise and right of way for an electric railway from Walla Walla past College Pl., looping south to Milton, back to Russell Creek, to Mill Creek and back to the city.

Fairmont, W. Va.—The Fairmont & Clarksburg Traction Co. plans to extend its lines.

Grafton, W. Va.—See "Power, Gas and Electricity."

Kenosha, Wis.—Articles of organization have been filed here by the Kenosha & Lake Geneva Ry. Co., with capital stock of $25,000, to build an electric railway from Kenosha to the lake regions.

RAILROADS.

Notes Arranged Alphabetically by States.

Texarkana, Ark.—The Louisiana & Arkansas Ry. Co. (G. Knobel, Ch. Engr., Winnfield, La.) is stated to have decided to extend its line a distance of about 40 miles. Its northern terminal is Hope, Ark., and its southern terminal is Jena, La.

Jamestown, Cal.—T. S. Bullock, of San Jose; S. D. Freshman, and W. C. Potts, of Jamestown, are among the incorporators of the Jamestown & Yosemite R. R. Co., recently incorporated to construct a line from Jamestown to Mariposa, a distance of 40 miles, and a branch 30 miles in length to an available point in the Yosemite Valley; capital stock, $1,000,000. Principal office will be in San Francisco.

Hartford, Conn.—City Engr. Ford is reported to have completed plans for abolishing the grade crossings of Flower, Sigourney and Hamilton Sts., on the Hartford division, west of the Union depot, Walnut St. and Avon St., on the north and Garden and Woodland Sts. on the Central New England road. The plans also include the rebuilding of a bridge over Park River at the Boule. near the south end of Forest St.

Centralia, Ill.—The Northwestern & Gulf R. R. Co. has been incorporated, with principal office at Chicago, and capital stock $100,000. The line is planned to run from Centralia to a point on the Ohio River near Shawneetown, Ill. Incorporators: Walter Mueller and W. Elden, of Chicago; J. M. Steham, Pasadena, Cal., and J. D. Wagoner, Ft. Madison, Ia.

Joliet, Ill.—The Will County Bd. of Superv. are stated to have adopted a resolution to pay the Rock Island R. R. Co. (W. L. Darling, Ch. Engr., Chicago), to remove the railroad tracks from the court house square.

Leavenworth, Kan.—See "Miscellaneous."

New Orleans, La.—Surveyors are reported to be in the field in Mississippi laying out a route and compiling estimates for the New Orleans & Mississippi Midland R. R. Surveys have been made for about 200 miles of the road. The line is proposed to run from New Orleans northward to Carthage, Miss. This will be made the terminus until the line can be extended to Pontotoc, and from there it will be built into Memphis. The proposed line will practically parallel the Illinois Central R. R. through Mississippi. R. P. Duncan and James McNaught, New York, N. Y., and T. M. Miller, New Orleans, are reported interested.

**Camden, N. J.*—Press reports state that contracts have been awarded by the Pennsylvania R. R. Co. as follows for work on its Camden, N. J., elevated structure: to Sparks & Evans, Philadelphia, Pa., for excavation and the masonry for retaining walls and bridge construction. Harry W. Young, of Camden, for filling between the retaining walls; and Brann & Stuart for constructing the trestles for the elevated tracks. This work covers a distance of about 1½ miles, from 2d St. to Cooper's Creek, and will cost about $200,000.

Newark, N. J.—Officials of the Erie R. R. Co. (W. L. Derr, Ch. Engr., New York City) are reported to be perfecting plans for the improvement of its Paterson branch line within the city limits which will call for an expenditure of about $2,000,000. Among the improvements will be the elimination of grade crossings, a new passenger station and better freight facilities at the foot of 4th Ave., and the rebuilding of the bridge across Passaic River.

Marion, N. C.—A corps of engineers of the Southern Ry. is about to locate a line between Marion, N. C., and Johnson City, Tenn. The proposed road will make possible a short line between the Virginia coal fields and the coast at Charleston. H. W. Wells, Engr. of Construction, Washington, D. C.

Youngstown, O.—The Cleveland, Youngstown & Ohio River R. R. Co., of Youngstown, has been incorporated, with a capital of $200,000, to build a steam road from Cleveland to Lowellvile, through the counties of Cuyahoga, Summit, Portage, Trumbull and Mahoning. Incorporators: Thos. E. Connell, F. B. Hamilton, Jas. J. McNally, and others.

**Pittsburg, Pa.*—The American Bridge Co., of New York, N. Y., is stated to have secured the contract for constructing the South Side elevated tracks of the Wabash R. R. for about $300,000. The South Side line will extend from the Wabash tunnel through Mt. Washington up the Monongahela River to the mills of the Jones & Laughlin Steel Co., where it will connect with the Monongahela Connecting R. R.

Orange, Tex.—L. Miller and W. H. Stark, Pres. and Vice-Pres. of the Orange & Northwestern R. R. Co., are reported to have returned here from Austin, where they held a conference with Pres. B. F. Yoakum and other officials of the 'Frisco R. R. As a result of this conference it has been decided to begin at once the first 50-mile extension of the Orange & Northwestern R. R., and the contract for the construction will be let at an early date.

Seattle, Wash.—Articles of incorporation, with Hugh Thos. Burke, Jacob Furth, W. D. Hefius and other business men of Seattle as incorporators, will be filed soon. The company will have a capital of $5,000,000, and will construct a railroad from Valdez through the Copper River Valley to a point on the American Yukon.

Farmington, Wash.—The Eastern Washington Constr. Co. is reported organized by J. H. Abbott, J. M. Thomas, E. T. Fannatt, and others, all of Spokane, to construct a railroad from Farmington through the White Pine belt, a distance of 110 miles.

Charleston, W. Va.—A charter has been granted to the Coal River Ry. Co., of Charleston, to build and operate a railroad from Point Pleasant to St. Albans and Bramwell. Capital, $2,000,000. Incorporators: A. D. McCarkle, Henry Fry, G. O. Chilton, and others, of Charleston.

Fairmont, W. Va.—It is reported that the Baltimore & Ohio R. R. Co. will construct a railroad bet. Fairmont and Confluence, a distance of 80 miles. D. D. Carothers, Ch. Engr., Baltimore, Md.

**Laona, Wis.*—Winston Bros. Co., of Minneapolis, Minn., and A. D. McDougall, of Milwaukee, are stated to have secured the contract for constructing a branch of the Chicago & North-Western R. R., from Laona to Saunders, Mich., about 30 miles; probable cost of work, $350,000.

Thermopolis, Wyo.—The Burlington R. R. Co. (T. E. Calvert, Ch. Engr., Chicago, Ill.) is reported to be taking the preliminary steps for the extension of its Cody branch to Thermopolis, Wyo., a distance of about 90 miles.

Ottawa, Ont.—Press reports state that at a recent meeting of the directors of the New York & Ottawa R. R. Co., at the Grand Central Station, New York, N. Y., a general outline of the improvements necessary to place the road in a first class condition were decided upon. Contracts will shortly be given out for these improvements. Henry W. Gates is reported to have been appointed Gen. Mgr., with offices at Ottawa, Ont.

PUBLIC BUILDINGS.

Notes Arranged Alphabetically by States.

New Decatur, Ala.—The erection of a city hall, at a cost of $10,000, is reported contemplated.

Point Bonita, Cal.—Bids will be received by Capt. W. C. Wren, Q. M. U. S. A., San Francisco, on Feb. 13, for the construction, plumbing, steam heating and electric wiring of 21 buildings at Point Bonita, Cal., as advertised in The Engineering Record.

Stamford, Conn.—J. H. Provost, City Clk., writes that E. L. Scofield is Chmn. of the Com. which will have charge of the erection of the Municipal building, which will cost $150,000. Architect, C. Mellen, 27 W. 30th St., New York, N. Y.

Hartford, Conn.—Bids will be received by Geo. M. Cole, Brigadier Gen. C. N. G., Secy. Armory Comn., at State Capitol, on Feb. 1, for construction of an arsenal and armory, including heating, electric work and plumbing, as advertised in The Engineering Record. Probable cost, $350,000.

Chickamauga Park, Ga.—Bids will be received by Capt. C. Nixon, Q. M. U. S. A., on Feb. 11, for constructing, plumbing and gas piping a lavatory building at this post, as advertised in The Engineering Record.

Atlanta, Ga.—The Bd. of Directors of the Chamber of Commerce, it is reported, is considering the erection of an auditorium. Robt. F. Maddox, Pres.

Chicago, Ill.—The Chicago Baptist Hospital Assoc., it is reported, is considering the erection of a wing to the present building at a cost of $100,000. A. E. Wells is one of the directors of the Assoc.

Plans for rebuilding the Old People's Home, on Indiana Ave. and 39th St., as prepared by Shepley, Rutan & Coolidge, 84 Van Buren St., provide for an administration building, dining hall and kitchen, power plant, and 4 dormitories. All 3-story brick and stone buildings, and the total cost estimated at $200,000.

Lake Bluff, Ill.—It is reported that Capt. Albert Ross has been appointed by Secretary Morton of the Navy to build the new naval station here, for which there is an appropriation of $250,000 available.

Bloomington, Ind.—The Co. Comrs. are contemplating the erection of a new court house at a cost of about $75,000.

Delphi, Ind.—A $10,000 Carnegie library is to be erected here next spring. It is reported that bids are to be asked for its construction as soon as plans have been prepared. J. W. Fawcett, City Clk.

New Harmony, Ind.—It is reported that Dr. Edw. Murphy has given $150,000 for a library to be erected at the Workingmen's Institute.

Knoxville, Ia.—F. J. Treat, Sec'y Bd. of Control, Des Moines, writes that bids will be received on Feb. 1 for erecting 3 buildings and remodeling one building at the Asylum for Inebriates at Knoxville.

Louisville, Ky.—The Library Trus. have approved the plans prepared by Pilcher & Tachau for the public library, which they have decided is to face on York St. It is to be a stone structure 3 stories high. Plans are now to be prepared for the 8 branch libraries which are to be erected with the $200,000 recently donated by Andrew Carnegie.

New Orleans, La.—It is reported that preliminary plans have been prepared for a 4-story brick, stone and terra cotta building which the Bd. of Trus. of the Eye, Ear and Throat Hospital is contemplating erecting at an approximate cost of $150,000.

Ft. Howard, Md.—It is stated that bids will be received Feb. 10 by Wm. M. Cruikshank, Q. M., for constructing 2 sets officers' quarters and barracks, including plumbing, heating and electric wiring; also ordnance store house, wagon shed, oil house and coal shed at this post.

Springfield, Mass.—The Co. Comrs. are said to be considering the erection of a fireproof record building west of the court house on Elm St., at a cost, including ground, of about $200,000.

Battle Creek, Mich.—Bids will be received by the Superv. Archt. Treas. Dept., Washington, D. C., Mar. 6, for constructing (except heating apparatus) the U. S. Post Office at Battle Creek, as advertised in The Engineering Record.

Grand Rapids, Mich.—The Bd. of Mgrs. of the Michigan Soldiers' Home, it is reported, is considering the erection of new buildings at the home at a cost of $100,000, and are about to petition the legislature for permission to make the said improvements.

Carlton, Minn.—Bids will be received until Feb. 13 by the Co. Comrs., for erecting an addition to the court house. August R. Norman, Co. Aud.

**Purvis, Miss.*—It is stated that the contract to erect the court house has been secured by Lewman & Co., of Louisville, Ky., at $43,516.

Greenwood, Miss.—It is reported that at the March meeting of the Bd. of Superv. the contract for erecting the court house will be awarded. Probable cost, $75,000.

New Albany, Miss.—C. S. Cullens, Chancery Clk., writes that the plans of Dobson & Bynum, of Montgomery, Ala., have been accepted for a jail. Bids for the erection will be received on Feb. 9. Probable cost, $12,500.

Monticello, Miss.—Bids will be received Feb. 7 by the Bd. Superv. for furnishing material and erecting a county jail here. W. H. Speights, Chancery Clk.

Louisiana, Mo.—Bids will be received Feb. 28 by Jas. Knox Taylor, Superv. Archt. Treas. Dept., Washington, D. C., for constructing U. S. Post Office here.

Columbia, Mo.—Bids will be received Feb. 27, by Jas. Knox Taylor, Superv. Archt. Treas. Dept., Washington, D. C., for constructing U. S. Post Office here.

St. Louis, Mo.—It is reported that the Presbyterian Society is planning to erect a $1,000,000 hospital. Rev. Dr. S. J. Nicolls, is Chmn. of Com.

Lockport, N. Y.—Bids will be received Feb. 2 by Fred H. Krull, Clk. Bd. Supervs., for removing present boiler and installing 2 c. i. sectional steam boilers, including pipe, fittings, valves, etc., in County Almshouse.

Binghamton, N. Y.—Bids will be received by the State Bd. of Armory Comrs., Albany, on Feb. 14, for the construction, structural steel and iron work, heating, plumbing, electric light wiring and fixtures, and gas piping for a State Armory, at Binghamton, as advertised in The Engineering Record.

New York, N. Y.—Plans have been filed for the nine-story building which is to be erected at 208 East 64th St., for the Manhattan Eye, Ear & Throat Hospital. The building is to be of brick, with stone and terra cotta trimmings, and is estimated to cost $600,000. York & Sawyer, 156 5th Ave., are the archts.

Bids will be received Jan. 26 (readvertisement) by Wm. McAdoo, Police Comr., for furnishing material and erecting (except heating and ventilating system, boilers and steam piping) new building for headquarters for Police Dept. on Grand, Centre and Broome Sts.

Plans have been filed for a 3 and 4-story br and stone public library to be erected at 444 Amsterdam Ave., for the City of New York, at a cost of $75,000. Babb, Cook & Willard, Archts., 3 W. 29th St.

Brooklyn, N. Y.—Bids were opened on Jan. 12 by John McG. Woodbury, Comr. St. Cleaning, N. Y. City, for a stable to be erected on Flushing Ave. and Graham St., Brooklyn Boro.:

For erecting the building—Clark & Stone, 229 Kent St., Brooklyn, $330,000; S. W. Carlin Cont. Co., $333,000; Thos. B. Leahy, $352,000; L. W. Seaman & Sons, $343,000; Snare & Triest Co., $338,000; Chas. H. Peckworth, $349,000; R. E. Henningham, 45 Court Sq., Brooklyn, $324,876; P. J. Carlin Const. Co., 1 Madison Ave., N. Y. City, $326,000; Buckley Realty & Const. Co., $350,000, and D. J. Ryan, $355,000.

Ventilating and heating—Thompson Starrett Co., $6,100; W. W. Tobin, $6,215; N. Y. Steam Fitting Co., $6,154; Rossman & Bracken, $6,200; Walker & Chambers, $6,724; Jas. Curran Mfg. Co., 512 W. 36th St., N. Y. City, $6,090; Evans, Almirall & Co., 281 Water St., N. Y. City, $5,645; Baker, Smith & Co., W. Houston St., N. Y. City, $5,589; Dowdswell Bros., $6,949, and Wm. Horne Co., $6,878.

Plumbing and gas fitting—Rossman & Bracken Co., 132 E. 42d St., N. Y. City, $14,000; Chris. Nally, $14,683, and Jas. Fay, $14,767.

Electric work—Thompson Starrett Co., $2,298; Brown & McClure, 160 5th Ave., N. Y. City, $2,130; Geo. Widerinan Elect. Co., 21 New Chambers St., N. Y. City, $2,100, and Fred Nolte, $2,500.

Flushing, N. Y.—Bids will be received by the State Armory Bd. at Albany on Feb. 7 (readvertisement) for constructing, heating, plumbing, electric wiring and fixtures and gas piping, for a state armory, to be erected at Flushing, as advertised in The Engineering Record. Appropriation $72,000.

Hillsboro, N. D.—Bids will be received Feb. 7 by the Bd. Co. Comrs., for erecting a fireproof court house; cost not to exceed $60,000. Peter Davidson, Co. Aud.

Cincinnati, O.—Saml. Hannaford & Sons, Hulbert Blk., it is reported, have been appointed by the Bd. of Pub. Service as supervising archts. of the new hospital.

**Columbus, O.*—The State Bd. of Agriculture, it is reported, has awarded the contract for erecting 2 machinery buildings at the State Fair Grounds, to C. J. Close, at a total of about $36,640, and the contract to construct the poultry building to F. F. Wolfe, at $10,500. Contractors of Columbus.

Washington, Pa.—Geo. C. Dietrich, 935-39 N. 7th St., Philadelphia, writes that he is receiving sub-bids for the construction of the U. S. Post Office at Washington.

Philadelphia, Pa.—A building permit has been granted to Frank E. Wallace, De Long Bldg., for a 4-story brick and stone hospital, which is to be erected at 33d St. and Lancaster Ave. at a cost of $51,400.

The following are reported to be the bids including time for completion, received Jan. 16 for erecting the house of detention for the Juvenile Court at 22d and Arch Sts.: Henderson & Co., $78,277, 180 days; Doyle & Doak, $81,884, 190 days; John R. Wiggins & Co., $88,876, 150 days; John W. Emery, $97,196, 210 days.

Knoxville, Tenn.—Leon Beaver, French & Roberts Bldg., has completed plans for a 2-story brick fire hall, which the City Council intends erecting on Highland Ave. for the W. Knoxville Fire Co.

Rosslyn, Va.—Bids are wanted Feb. 4 for constructing a brick building for a coal testing plant. Address Capt. A. W. Butt. Q. M. U. S. A., Washington, D. C.

Newport News, Va.—It is reported that the erection of a $50,000 brick sanatorium on Hampton Roads in under consideration. Maj. Saml. Buxton is reported interested in the project.

Ft. Wright, Wash.—Bids are wanted Feb. 15 for constructing, including plumbing, steam-heating, gas-piping and wiring for electric lighting 1 double set Lieutenants' quarters at this posr. Capt. Edw. A. Shuttleworth, Q. M., U. S. A.

Items marked thus give the names of parties awarded contracts.

North Yakima, Wash.—The Co. Comrs. have decided to erect a new court house at a cost of $75,000 and the Co. Auditor has been authorized to receive plans for the same.

Wheeling, W. Va.—The following are the bids recently received for the construction of the Post Office, Court House and Custom House at Wheeling: John C. Robinson, Chicago, Ill., $216,505; Standard Constr. Co., Chicago, Ill., $214,750; Fissel & Wagner, New York, N. Y., $237,000; Cramp & Co., Philadelphia, Pa., $230,000; Mankin Constr. Co., Richmond, Va., $237,788; Richardson & Burgess, Washington, D. C., $226,100; Chas. McCane Co., Philadelphia, Pa., $230,980; Broderick & Wind, St. Paul, Minn., $213,813, and W. E. Spier, Washington, D. C., $242,000.

Superior, Wis.—It is reported that plans have been approved for the federal building which is to be erected here in the spring at a cost of about $350,000.

**Ft. D. A. Russell, Wyo.*—Capt. W. S. Scott, Q. M., U. S. A., Cheyenne, writes that contracts for buildings at this post (bids opened Dec. 14) have been awarded as follows: To R. W. Bradley & Sons, Cheyenne, for construction of a s. s. Field Officer's Quarters, $11.880; two d. s. Captain's Quarters, $34,650 one d. s. Lieutenant's Quarters, $13,464; one Wagon shed, $2,871; enlargement of Guardhouse, $8,554, and enlargement Q. M. Storehouse, $4,059. To M. P. Keefe, Cheyenne, construction of four Cavalry stables, $58,540, and two double Stableguard shops, $7,724. To A. I. Gray, Denver, Colo., construction of one Bachelor Officers Quarters, $26,756, and two double Barracks, $93,024. To St. John & Barnes, Colorado Springs, Colo., for the plumbing of all buildings, $22,892. To St. John Bros., Colorado Springs, Colo., heating of all buildings, $16,645, and to Graeber Bros., Lawrence, Kan., electric wiring of all buildings, $3,780.

Laramie, Wyo.—All bids opened on Sept. 14 for erecting the U. S. Post Office at Laramie have been rejected, and new bids will be received; probable cost of building about $74,000.

BUSINESS BUILDINGS.

Notes Arranged Alphabetically by States.

**Birmingham, Ala.*—L. S. Carson, it is reported, has received the contract to erect the 4-story Brown Bldg. on 2d Ave. at about $25,000.

Mobile, Ala.—Dr. O. F. Cawthon, it is stated, has had plans prepared by Watkins & Hutchinson, of Mobile, for a 5 or 6-story hotel which he intends erecting at Conception and St. Francis Sts., at an estimated cost of $250,000.

Arkansas City, Ark.—The Colorado Block, a 4-story structure, it is stated, has been destroyed by fire.

Los Angeles, Cal.—The Pacific Ry. & Amusement Co., it is reported, has been incorporated with a capital of $100,000 to develop Alamitos as a pleasure resort. J. McMillan and Geo. E. Pillsbury, Traffic Mgr. and Ch. Engr., respectively, of the Pacific Electric Ry. Co., are reported among the incorporators.

*H. X. Goetz, Builders' Exchange, it is reported, has received the general contract for the Hotel Venetia, which is to be erected at Pacific Ave. and Pacific Promenade at Ocean Park, at a cost of about $30,000. March & Russell, Byrne Bldg., are the archts.

La Junta, Colo.—Dr. Albert L. Stubbs and Dr. Edw. W. Ragsdale, it is reported, are among the incorporators of the newly organized La Junta Sanitarium Assoc., which has been formed for the purpose of erecting a santiarium here at a cost of about $25,000.

Yampa, Colo.—Dr. Leon C. Gilbert is said to be planning to erect a $75,000 sanitarium about 1 mile from here.

Denver, Colo.—It is reported that the Burlington R. R. Co. intends erecting a warehouse and refrigerator storage plant to cost about $30,000, for the benefit of Swift & Co., the Western Packing House, Schwarzschild & Sulzberger Co., and other Omaha packing houses shipping into this market. I. S. P. Weeks, Engr., Lincoln, Neb.

**New Haven, Conn.*—L. C. Bates Co. will erect a cold storage building, at George and State Sts., to cost $14,000. Carpenter and mason, H. W. Lines. Architect, L. W. Robinson, 123 Exchange Bldg.

Hartford, Conn.—It is stated that plans and specifications are about completed by the New York, New Haven & Hartford R. R. Co. (C. M. Ingersoll, Ch. Engr., New Haven) for the construction of an outward freight house, 600x35 ft.; one transfer house, 800x16 ft., and one inward freight house, 800x50 ft., to be erected bet. Morgan and Pleasant Sts.

Chicago, Ill.—Frost & Granger, 184 La Salle St., have prepared plans for the Hyde Park branch of the Y. M. C. A., which is to be 5 stories high and erected at 53d St. and Madison Ave., at a cost of $125,000.

Wm. H. Barry is having plans prepared and will take figures on a 3-story brick store and apartment building, to be built at Evanston and Lawrence Ave. Estimated cost, $175,000.

Henry L. Ottenheimer, 109 Randolph St., has made plans for a 3-story factory, 70x80 ft., to be built on Poplar St., near Archer Ave., for the Hoffmeier Soap Co., at a cost of $25,000.

S. M. Randolph, 138 Washington St., has completed plans for a 7-story addition, 60x150 ft., to the mercantile building of the Durand & Kasper Company, on W. Lake and Union Sts. Cost, $60,000.

Shepley, Rutan & Coolidge, 84 Van Buren St., are the architects of a 3-story brick and stone storage building to be erected at 77 Plymouth Pl., by the Chicago Edison Co. Cost, $50,000.

Howard Shaw, 175 Dearborn St., is the architect for a commercial building to be erected for Philo A. Otis, on Michigan Boule. and 12th St. It will be 3 stories high, of brick, 50x145 ft., and will cost $25,000.

*Plans for a 7-story brick and steel addition to the Union League Club and for interior remodeling of the present clubhouse at Jackson Boule. and Custom House Court have been submitted to the Building Commissioner. The D. H. Burnham Co., The Rookery, are the archts., and Wells Bros. Co., 1014 Monadnock Bldg., the contractor.

Lake Bluff, Ill.—Thos B. and Joel W. Stearns, of Denver, Colo., it is reported, are interested in a company which intends erecting a hotel here at cost of about $250,000.

Taylorville, Ill.—C. M. Parker is reported interested in the organization, of a company with a capital of $25,000, for the purpose of erecting an opera house.

Delphi, Ind.—John H. Burr, it is reported, is one of the chief promoters of the forming of a company for the purpose of erecting a $15,000 opera house in this city.

Ft. Wayne, Ind.—The Corporation Finance Co., of Indianapolis (H. C. McCallum, local mgr.), it is reported, is contemplating the erection of a 6-story fireproof hotel at Berry and Harrison Sts., to cost about $330,000.

A. B. Jones, Mgr. of the Crawford House, and others, it is reported, are contemplating the erection of a $400,000 hotel in this city.

Sioux City, Ia.—Paul Leader, it is stated, is contemplating the erection of a 3-story, 50x150 ft. hotel, on Nebraska St., at cost of $15,000.

Peavey & Nash, furniture dealers, it is reported, have arranged with D. T. & W. S. Gilman to erect a 3-story, 100x94-ft. business building at 6th and Pierce Sts., at a cost of $30,000. W. W. Beach, 721 Toy Bldg., is the archt.

Des Moines, Ia.—John A. Sandholm, of the Sandholm Medicine Co., is said to be considering the erection of a brick building at a cost of about $15,000, which will include laboratories and office rooms.

Louisville, Ky.—It is reported that the new savings bank, of which John M. Atherton is Pres., is to erect at 4th Ave. and Market St. an 8 to 10-story office building, to cost about $125,000.

Covington, Ky.—Crigler & Crigler will erect a 4-story business building, to cost $15,000.

Baltimore, Md.—The U. S. Fidelity & Guaranty Co., it is reported, has selected the plans submitted by Simonson & Pietsch, of Baltimore, for their proposed 7 story office building, which is to be erected at Calvert and German Sts.

*Chas. Gilpin, of Baltimore, it is reported, has received the contract to erect a 15-story office building at Baltimore and Calvert Sts., for the Maryland Realty Co. Geo. S. Cooper, of Washington, D. C., is the archt.

The Consolidated Gas Co., it is stated, intends erecting a 5-story building at Lexington and Liberty Sts., and is receiving bids for its construction until Jan. 28. Sperry, York & Sawyer are the archts.

**Baltimore, Md.*—The Trus. of the Sheppard & Enoch Pratt Hospital, it is stated, have awarded the contract for erecting a 4-story warehouse at 119 Cheapside to John E. Marshall & Son, of Baltimore.

The Trus. of the Sheppard & Enoch Pratt Hospital, it is reported, are contemplating the erection of a 4-story warehouse at 116 Commerce St.

Pittsfield, Mass.—Willis A. Webber, it is stated, intends erecting a 4-story brick store and office building at North and Bradford Sts., at a cost of about $50,000.

Fairhaven, Mass.—The New York, New Haven & Hartford R. R. Co., it is stated, intends erecting a passenger station in this city and has purchased a site at Main and Fort Sts. for the purpose. C. M. Ingersoll, Ch. Engr., New Haven Conn.

Chelsea, Mass.—The Academy of Music building, it is reported, has been destroyed by fire. Reuben Broomfield, owner.

Worcester, Mass.—Albert S. Heywood, Vice-Pres. Heywood Boot & Shoe Co., writes that it is proposed to erect an addition to its factory building. No additional power equipment will be required.

Springfield, Mass.—Pages & Hayes, 476 Main St., it is reported, are preparing plans for an assembly hall which it is proposed erecting in this city, and which Boston and Springfield capitalists are interested in.

Fall River, Mass.—Bids will be received Jan. 31 by the Bldg. Com. of the Fall River Daily Globe Publishing Co. for erecting a 5-story brick building. Jos. M. Darling, Archt., 56 N. Main St.; D. D. Sullivan, Chmn.

Boston, Mass.—Plans have been filed for a 2-story brick mill and storage building, 52x122 ft., to be located on Atkinson St., by the South Bay Wharf & Terminal Co., 60 South St. Archt., Orr, Wright & Churchill, 101 Tremont St.

Detroit, Mich.—Dan'l J. Healy, it is stated, has purchased a site at Miami Ave. and John R. St., on which he proposes erecting an 8-story building.

Howard City, Mich.—The Grand Rapids Brewing Co., it is stated, intends erecting a $30,000 hotel here.

Saginaw, Mich.—E. C. Peters, Secy. Elks Lodge, No. 47, writes that the building committee has not yet selected an architect for its proposed building.

Excelsior, Minn.—It is reported that J. W. Wood will erect a $16,000 business building here.

Minneapolis, Minn.—It is reported that the O. H. Peck Co. has purchased the site on which stood the Peck building, which was recently destroyed by fire, and will erect a 3-story brick structure at a cost of about $40,000.

St. Joseph, Mo.—Eckel & Mann, Commercial Bank Bldg., it is reported, are the archts. for an office building which John B. Huber intends erecting at a cost of $35,000.

Kansas City, Mo.—The Lisburn Realty Co., it is reported, has purchased a site at 8th St. and Grand Ave., and will erect thereon an 8-story $500,000 office building.

Madison, N. J.—The Y. M. C. A., it is reported, is contemplating the erection of a building at an estimated cost of $40,000.

Newark, N. J.—John W. Ferguson, Paterson Natl. Bank Bldg., Paterson, N. J., it is reported, has been engaged by the Central R. R. of New Jersey to prepare plans and specifications for a 6 story brick and stone fireproof storage and bonded warehouse which is to be erected at Lawrence, Mechanic and Ward Sts. and the Central tracks, in this city, at a cost of about $500,000.

Camden, N. J.—The warehouse of the Farr & Bailey Co., it is reported, has been destroyed by fire.

Stanhope, N. J.—Chris. Kelly is reported interested in the organization of a stock company for the purpose of erecting an opera house here at a cost of about $20,000.

Newark, N. J.—See "Railroads."

Jersey City, N. J.—The officials of the Pennsylvania R. R., it is stated, intends erecting a Y. M. C. A. building at the Boule. and Van Ripen Ave., at a cost of $30,000.

The members of the Robt. Davis Assoc., it is reported, are contemplating the erection of a new building at a cost of about $75,000.

Goshen, N. Y.—Grant H. Brown, Pres. of the United Lead Co., 71 B'way, N. Y. City, it is stated, has purchased the Low Wood Park, in this city, and will make improvements at a cost of about $100,000, which will include the remodeling of the dwelling on the grounds and the erection of new stables.

Kingston, N. Y.—It is reported that the congregation of St. Peters Church, intends erecting a hall at a cost of $20,000, to be used for entertainments, lectures, etc., given by the church.

Brooklyn, N. Y.—It is reported that a site has been purchased on Lafayette Ave. on which it is proposed erecting the new Academy of Music.

Utica, N. Y.—The Crouse Block at Broad and John Sts., it is reported, has been destroyed by fire.

Rockaway Beach, L. I., N. Y.—Plans are being prepared for a casino and bathing pavilion, which is to be erected by the Hotel Shanley Co. in front of the Hotel Shanley at West Arverne. Estimated cost, $85,000.

New York, N. Y.—Plans have been filed for the 13 story fireproof brick clubhouse, with marbel trimmings, which is to be erected at 32 W. 40th St. for the Engineers' Club. Cost, $500,000. Whitfield & King, 160 5th Ave., are the archts.

Watertown, N. Y.—The members of the Union Club are said to be contemplating the erection of a new club house at an approximate cost of $40,000. C. W. Symonds, is Pres.

Grand Forks, N. D.—The International Harvester Co., it is reported, intends erecting a $40,000 building in this city.

Norwood, O.—The Allis-Chalmers Co., it is reported, has secured a permit to erect a $20,000 addition to its plant here.

Toledo, O.—The Turners, it is reported, are preparing to erect a $40,000 society building.

Youngstown, O.—The Erie R. R. Co. (R. S. Parsons, Engr. M. W., Cleveland), and the Pittsburg & Lake Erie R. R. Co. (J. A. Atwood, Ch. Engr., Pittsburg, Pa.), it is reported, are contemplating the erection of a passenger station here at a cost of about $200,000.

Cincinnati, O.—M. D. Woodford, it is reported, has engaged Elzner & Anderson, 18 E. 4th St., to prepare plans for a 7-story building which is to be erected at Walnut and 8th Sts. for Saml. Ach & Co., the millinery firm. Approximate cost, $80,000.

Harmony, Pa.—Plans and specifications have been prepared for a building which the Pythian Home Assoc. intends erecting here as a home for the aged members, the cost to be about $50,000. J. C. McMahon, of Pittsburg, is Pres. of the Assoc.

**Pittsburg, Pa.*—The Drake & Stratton Co., 35 S. Broad St., Philadelphia, it is reported, has received the contract for the foundation of the terminal freight station which is to be constructed at the Point by the Pennsylvania R. R., to take the place of the Duquesne freight depot. It will require about 40,000 tons of concrete and the contract is reported to amount to about $375,000. It is reported that the building is to be 4 stories high, 48x880 ft., and is to be constructed of steel, requiring about 2,000 tons. Plans are now being prepared for the superstructure of the building.

Furness, Evans & Co., of Philadelphia, it is reported, are the archts. for a passenger station which the Pennsylvania R. R. Co. intends erecting in the East End, at a cost of about $100,000. It is to be built of red brick with sandstone trimmings, and it is stated that contracts for its erection will soon be let. W. H. Brown, Ch. Engr., Philadelphia.

A building permit has been granted to Oliver P. Nicola to erect an 8-story brick and steel warehouse, 31x95 ft., on First Ave. and Wood St., at a cost of $75,000.

It is reported that a 10-story office building is to be erected on Lower 5th Ave. by the Pittsburg Coal Co.

New Castle, Pa.—It is reported that the officials of the Pennsylvania R. R. will spend about $198,000 in improving the roundhouse and repair shop at Lawrence Junction, a division point for the Pittsburg, Youngstown & Ashtabula and the Erie & Pittsburg divisions. W. H. Brown, Ch. Engr., Philadelphia.

Providence, R. I.—The Y. W. C. A. has secured a permit to erect a 7-story and basement red brick and terra cotta building at Jackson and Washington Sts., to cost about $125,000.

Memphis, Tenn.—Robt. E. and Baylis G. Lee, it is stated, intend erecting a 22-story building at Main and Madison Sts.

Seattle, Wash.—Local press reports state that the Norris Safe & Lock Co. intends erecting on 3d Ave., S., a 6-story and basement 60x120 ft. red pressed brick building, at a cost of $55,000.

Seattle, Wash.—The American Savings Bank & Trust Co., it is reported, intends erecting a 12-story business building at 2d Ave. and Madison St., the cost to be about $500,000.

Judge Thos. Burke is also said to be contemplating the erection of a 12-story building adjoining the building of the American Savings Bank & Trust Co.

Tacoma, Wash.—A 4-story brick storage building, it is reported, is to be erected by the Tacoma Carriage & Baggage Transfer Co. (John B. Ternes, Pres.), on St. Helens Ave., at an estimated cost of $20,000.

*Brescoe & Heath, it is reported, have received the contract to remodel the Grand Pacific Hotel into a theater at a cost of $25,000. J. P. Howe, of Seattle, is owner.

Sheboygan, Wis.—It is reported that the Northwestern R. R. Co. has appropriated $500,000 to make improvements to its property in this city, the improvements to include the erection of a depot. E. C. Carter, Ch. Engr., Chicago, Ill.

Watertown, Wis.—Bids will be received Feb. 8 by the Bd. Trus. for erecting a 4-story Masonic temple and office building. H. C. Koch & Son, Archts., Milwaukee; F. M. Eaton, Secy. Bldg. Com.

Winnipeg, Man.—It is reported that the members of the Catholic Club are contemplating the erection of a new 3-story building, at a cost of $20,000.

New York, N. Y.

412 W 26th St, 7-story br and stone factory; c, $35,000; o, A E Pelham; a, Price Iron Works.

124 W 44th St, 9½-story br and stone hotel; c, $80,000; o, Henry Dazian; a, Mulliken & Moeller.

48th St and 1st Ave, 5-story br and stone grain and flour mills; c, $15,000; o, New York Milling Co; John B Snook & Sons.

99th St and 2d Ave, 2 6-story br and stone stores and tenemts; total c, $70,000; o, Lowe & Jorrisch; a, Horenburger & Straub.

99th St and Madison Ave, 4 6-story br an stone stores and tenemts; total c, $140,000 o, Samuel Barkin; a, Edward A Meyers.

240 E 119th St, 6-story br and stone store and tenemts; c, $50,000; o, Raphael Kurz rok; a, Horenburger & Straub.

Amsterdam Ave and 167th St, 2 5-story b and stone stores and tenemts; c, $105,000; o, Donald Robertson; a, Manhattan Plan Co.

Brook Ave and 135th St, 5 5-story b stores and tenemts; total c, $220,000; o, Martin Haase and Geo C Lippmann; a, Lorenz F J Weiher.

12 W 40th St, 6-story br extension to 5-story br and stone store and studio bldg; c, $20,000; o, Walter P. Taylor; a, G A Schellenger.

CHURCHES AND DWELLINGS.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—A 7-story brick an stone apartment house is to be erected b Robt. Marsh & Co., on Olive St., at a cost o $150,000.

Atlanta, Ga.—Edw. M. Durant, Atlanta representative of the American Bonding Co., it is reported, intends erecting a 4-story apartment house of buff brick, on Peachtree St. and North Ave.

Items marked thus give the names of parties awarded contracts.

Chicago, Ill.—Jos. Cormack is to erect a 3-story apartment house on 66th St. and Monroe Ave., at a cost of $90,000.

C. Whitney Stevens, 140 Dearborn St., has been selected to prepare plans for a new church which the Diversey Boulvard M. E. congregation will erect at Seminary Ave. and Diversey Boule., at a cost of $35,000.

A 3-story apartment building is to be erected at 50th St. and Grand Boule., for Eiger Bros. Cost, $250,000.

An apartment house 3 stories high is to be be built in Sheridan Park, according to plans prepared by Paul Gerhardt, Schiller Bldg. Cost is estimated at $200,000.

Thomas McCall, 167 Dearborn St., is the architect of an apartment building which Jos. Cormack will build on 66th St. and Madison Ave. It will be 3 stories high, 150x100 ft. Cost is estimated at $90,000.

Indianapolis, Ind.—A. M. Sweeney, Pres. State Life Insurance Co., it is reported, intends erecting a $25,000 residence at 23d and Meridian Sts.

Indianapolis, Ind.—The Trus. of the Meridian St. Church, it is stated, have accepted plans prepared by Oscar D. Bolin, for the new edifice which is to replace the structure which was recently destroyed by fire. The total cost of the work is estimated at about $150,000. V. T. Malott is Chmn. of the Bldg. Com.

Ft. Wayne, Ind.—Wing & Mahurin, Pixley Bldg., it is reported are preparing plans for a $15,000 residence to be erected for Pres. John Chester Ball, of Keuka College, Keuka Lake, N. Y.

Baltimore, Md.—Mrs. Henry Barton Jacobs, it is stated, intends making improvements to her residence on Mt. Vernon Pl. at a cost of $75,000. John Russell Pope, of N. Y. City, is the archt.

New Bedford, Mass.—The members of the Church of St. John the Baptist (Father Neves, pastor), it is stated, have decided to erect a new edifice at Wing and 5th Sts., and have $25,000 available for the purpose.

Lynn, Mass.—The Washington St. Baptist Church, it is reported, was destroyed by fire on Jan. 15.

Joplin, Mo.—Garstang & Ray, of Joplin, it is stated, are preparing plans for a $15,000 edifice which the congregation of the Episcopal Church intends erecting. Rev. Mr. Weed, Pastor.

Auburn, Neb.—The congregation of the Presbyterian Church has decided to erect an edifice at a cost of $10,000.

Atlantic City, N. J.—Harvey J. Shumway, of Atalntic City, is preparing plans for a 6-story addition, 100x100 ft., to the Presston apartment house at Atlantic and Pennsylvania Aves. Probable cost, $70,000. Walter E. Edge, Prop.

Albuquerque, N. Mex.—The members of the First Presbyterian Church, it is reported, have decided to erect a new edifice at a cost of $25,000.

Rochester, N. Y.—The Hedding M. E. Church, it is stated, intends erecting a new edifice at a cost of $20,000. Rev. L. L. Rogers, Pastor.

New York, N. Y.—Plans have been filed by Jas. E. Ware & Son, Archts., 1170 B'way, for 4 tenemts. which are to be erected in 65th St., between 1st Ave. and Ave. A, at a cost of about $280,000 by the City & Suburban Homes Co.

Cleveland, O.—Hubbell & Benes, Citizens' Bldg., have prepared plans for a new edifice which the congregation of the East End Baptist Church intends erecting at Logan and Euclid Aves., at a cost of $80,000. The present edifice is to be remodeled for Sunday school purposes, the cost of this improvement to be about $20,000.

The Euclid-Genesee Realty Co., it is reported, has secured a permit to erect a 7-story apartment house at Genesee and Euclid Aves.

Lakewood, O.—A brick and stone edifice is to be erected by the Methodists of Lakewood, at Detroit St. and Winchester Ave., the total cost to be about $38,000. Fredk Baird, American Trust Bldg., Cleveland, O., is the archt.

Philadelphia, Pa.—Local press reports state that bids will be received until Feb. 4, for erecting an edifice for the Calvary Methodist Church at 48th St. and Baltimore Ave.

Providence, R. I.—Rev. T. W. Kelly, pastor of the Church of the Assumption, it is stated, has authorized Maggin, Walsh & Sullivan, of Boston, Mass., to prepare plans for a new brick or stone edifice which is to be erected at Linwood Ave. and Cranston St.

Flandreau, S. D.—Bids will be received Feb. 15 by the Trus. of Second Presbyterian Church for erecting a stone or cement block church here. Address B. M. Lawrence, Secy.

Chattanooga, Tenn.—W. T. Downing, of Atlanta, Ga., it is reported, has prepared plans for the apartment building which J. T. Lupton intends erecting at Georgia Ave. and McCallie St.

Dallas, Tex.—C. W. Bulger, of Dallas, it is reported, is the archt. for a new edifice which is to be erected by the congregation of the Baptist Church at a cost of $35,000. E. A. Bryan is Chmn. of the Bldg. Com.

Ft. Worth, Tex.—The congregation of the First Methodist Church is said to be considering the erection of a new edifice at 4th and Jones Sts., at a cost of $50,000. Dr. Alonzo Monk may be able to give further information.

Milwaukee, Wis.—Herman Nunnemacher, it is reported, has secured a permit to erect a $50,000 apartment house at Prospect Ave. and Bellview Pl.

NEW YORK, N. Y.

Perry and 4th Sts, 6-story br and stone tenemts; c, $60,000; o, Binder & Baum; a, Bernstein & Bernstein.

310 E 56th St, 2 6-story tenemts; total c, $80,000; o, Binder & Baum; a, Bernstein & Bernstein.

36 E 67th St, 5-story br and stone dwell; c, $200,000; o, Thompson estate; a, Henry Bacon.

76th St and Ave A, 6-story br and stone tenemts; c, $20,000; o, Conrad Reinhardt; a, Edward A Meyers.

350 E 114th St, 6-story br and stone tenemt; c, $25,000; o, Morris Fine; a, Bernstein & Bernstein.

Park Ave. and 102d St., 3 6-story br and stone tenemts; total c, $108,000; o, Chas I Weinstein; a, Geo F Pelham.

113th St and Amsterdam Ave, 2 6-story br and stone tenemts; total c, $120,000; o, Ferguson-Miller Realty Co; a. Geo F Pelham.

135th St and Lenox Ave, 8 6-story br and stone tenemts; total c, $304,000; o, Karpas & Wittner; a, Jacob H Amsler.

316 E 22d St, alterations to 5-story br and stone tenemt; c, $20,000; o, Anna Schroeder; a, O Reissmann.

143d St and Lenox Ave, 2 6-story br and stone tenemts; total c, $80,000; o, Mutual Constr Co; a, Jacob H Amsler.

144th St and Bway, 3 5-story br and stone tenemts; total c, $150,000; o, Elias Gussaroff; a, Moore & Landsiedel.

Bway and 144th St, 2 5-story br and stone tenemts; total c, $120,000; o, Elias Gussaroff; a, Moore & Landsiedel.

Broadhurst Ave and 149th St, 6-story br and stone tenemt; c, $50,000; o, Kottle Bros; a, Sass & Smallheiser.

137th St and Southern Boule, 4 5-story br tenemts; total c, $150,000; o. Robertson & Gammie; a, Schwartz & Gross.

157th St and Elton Ave, 5-story br tenemts; c, $35,000; o, Thos D Malcolm; a, M J Garvin.

Villa Ave and Southern Boule, 4-story br tenemt; c, $35,000; o, Chas F Ramsdell; a, Chas S Clark.

Webster Ave and 179th St, 5-story br tenemt; c, $45,000; o, Adolph Wexler; a, Harry T Howell.

SCHOOLS.

Notes Arranged Alphabetically by States.

**Birmingham, Ala.*—Theo. Poull & Co., of Birmingham, it is reported, has received the contract for erecting the high school, outside walls to be faced with common brick, at $87,200 (bids received Jan. 10).

Talklai, Ariz.—Bids will be received Feb. 15 by F. E. Lewpp, Comr. Indian Affairs, Dept. Interior, Washington, D. C., for furnishing material and constructing a stone mess hall and kitchen at Rice Station School. For further information apply to J. S. Perkins, Supt.

Oakland, Cal.—It is stated that bids are wanted Feb. 1 for ventilating and heating system, etc., for city school. Stone & Smith, Archts., 927 Market St., San Francisco.

New Haven, Conn.—The Bd. of Educ., it is reported, has requested local archts. to submit plans for the school which is to be erected at Scranton and Orchard Sts., Webster School District, the cost to be about $65,000.

Washington, D. C.—Henry Ives Cobb, 1757 N St., N. W., it is reported, is the archt. for the McKinley Memorial College of Government building which is to be erected on the grounds of the American Univ., and it is reported that certain contractors have been selected to submit bids for its erection by Feb. 21. Probable cost, $250,000. Bishop C. C. McCabe, Chancellor of the Univ., is a member of the Bldg. Com.

Chicago, Ill.—The McKinley School in East Chicago, a stone structure, it is reported, has been destroyed by fire.

Indianapolis, Ind.—The School Comrs. have approved plans for an 8-room school to be erected at Renal St., at an estimated cost of $45,000. Clarence Martindale, Archt., Indiana Trust Bldg.

Des Moines, Ia.—The erection of a high school in East Des Moines at a cost of about $100,000 is reported under consideration.

Fairfield, Ia.—The School Bd. has decided to submit to the citizens the question of erecting a school in the 2d Ward, the cost, including site, not to exceed $25,000.

Henderson, Ky.—C. A. Curtain, Columbia Bldg., Louisville, it is reported, has prepared plans for a $17,000 school to be erected by the Holy Name R. C. Church.

Shreveport, La.—It is reported that plans will be received Feb. 6 by the School Bd. of Caddo Parish for erecting a $20,000 school.

Baton Rouge, La.—L. M. Weathers, of Memphis, Tenn., has prepared plans for a $25,000 school.

Baltimore, Md.—Supt. Van Sickle, in his report to the School Bd., recommends that improvements be made at an estimated cost of $3,156,000, work to include the erection of new buildings and the enlarging and remodeling of structures now occupied and the purchase of lots in outlying districts.

**Boston, Mass.*—Plans have been filed by Guy Lowell, Archt., 1128 Tremont Bldg., for the erection of a 5-story brick and stone dormitory, 104x41 ft., for Simmons Female College, to be located on Brookline Ave. Contractor, Arthur C. Whitney, 18 Post Office Sq. Plans were also filed for a single story refrectory, 82x53 ft., to be located at rear of Brookline Ave. Estimated cost, $75,000.

Bids will be received Jan. 25 by the Schoolhouse Comrs. of Boston for erecting a 10-room primary school on McLellan and Glenway Sts., Dorchester. R. Clipston Sturgis, Chmn.

New Bedford, Mass.—The Trus. of the New Bedford Textile School, it is stated, have taken preliminary steps toward the erection of a new building at Maxfield and Purchase Sts.

Owosso, Mich.—The School Bd. has decided to erect an 8-room brick and stone school to replace the Bryant School, which was recently destroyed by fire, at a cost of $25,000.

St. Paul, Minn.—The School Bd. has decided to erect a 4-room addition to the Whittier School in the 9th Ward, and the Hancock School in the 10th Ward, and has engaged Mark Fitzpatrick, 17 W. 9th St., to prepare plans for the Whittier addition, and Hermann Kretz, N. Y. Life Insurance Bldg., plans for the Hancock addition, the total cost to be about $32,000.

The School Bd. has decided to erect an 8-room school in the 7th Ward, the cost to be about $32,000.

**St. Louis, Mo.*—Building permits have been granted for 3 buildings which are to be erected at Washington Univ. They are to be a 1-story shop, to cost approximately $20,000 (work on this building has already commenced); the Smith Academy and the manual training school. These last 2 buildings are to be exactly alike, 4 stories high, and to cost approximately $130,000 each. Jas. H. Bright, Lincoln Trust Bldg., is the contractor; Mauran, Russell & Garden are the archts.

Orange, N. J.—The Secy. Bd. of Educ. writes that only preliminary steps have been taken for the erection of a school at Main and Cleveland Sts.; probable cost of building, $75,000.

Princeton, N. J.—The Trus. of Princeton Univ. have decided that the new dormitory is to be from 2 to 5 stories high, of brick and stone, 284x80 ft., and to have 10 separate entries, each costing $13,000.

**Glens Falls, N. Y.*—The Bd. of Educ., it is stated, has awarded the contract for the structural iron work and cement foundations for the floors, stairs and landings of the high school to the Concrete Steel & Tile Co., New York City, at $18,590.

New York, N. Y.—The Bd. of Estimate on Jan. 13 authorized the issue of $2,058,931 corporate stock to provide for the completion of the new buildings for the College of the City of New York.

Bids will be received Jan. 30 by C. B. J. Snyder, Supt. of School Bldgs., for erecting, including plumbing and drainage, School No. 42, Boro. Bronx.

Plans have been filed for a 4-story brick school to be erected at Eagle Ave. and 163d St., Bronx Boro., at a cost of $85,000. Owner, N. Y. City. Archt., C. B. J. Snyder, 59th St. and Park Ave.

Bids will be received Jan. 30, by C. B. J. Snyder, Supt. School Bldgs., for sanitary work in school No. 32, Boro. Manhattan.

Canton, N. Y.—Pres. Almon Gunnison, it is stated, has announced that Andrew Carnegie has given to St. Lawrence Univ. $50,000 with which to erect a new science building.

Brooklyn, N. Y.—Bids will be received Jan. 30 by C. B. J. Snyder, Supt. School Bldgs., N. Y. City, for erecting additions and heating said additions to schools Nos. 84 and 125; bids will also be received for sanitary work and gas fitting in school No. 110.

Grand Forks, N. D.—Bids are wanted Jan. 30 for erecting a school in Dist. No. 10. W. E. Gooze, Clk. School Bd.

Marietta, O.—Andrew Carnegie has given to Marietta College $40,000, for a new library.

Niles, O.—At the election held Jan 9 the citizens voted in favor of issuing $40,000 bonds for school purposes.

Helena, Okla. Ter.—Bids are wanted Feb. 10 for erecting a high school. E. S. Wilhite, Secy. School Bd.

Allegheny, Pa.—Plans are being prepared for an industrial and trade school which is to be erected in the 2d Ward at a cost of $140,000.

Philadelphia, Pa.—Bids will be received by the Bd. of Educ. on Feb. 7 for the erection of 4 schools to cost in all about $300,000. One at 22d and Brown Sts.; one at 38th and Warren Sts.; one at Crown and Race Sts., and the fourth at Holmesburg.

Pittsburg, Pa.—The report of the Finance Com. of the Central Bd. of Educ. recommending the appropriation of $1,300,000 for the coming year, including $205,000 for a new High School, has been accepted by the Bd.

Dallas, Tex.—The Trus. of the Southwestern Medical College are contemplating the erection of a new building at a cost of $75,000.

Alice, Tex.—The citizens have voted in favor of issuing $15,000 bonds to erect a brick school.

Appleton, Wis.—Andrew Carnegie, it is reported, has given $50,000 to Lawrence Univ. with which to erect a library. Work is to be commenced in the spring.

Chippewa Falls, Wis.—Sedgwick & Saxton, Lumber Exchange, Minneapolis, Minn., have been selected as the archts. to prepare plans for a school which is to be erected here at a cost of $20,000.

Toronto, Ont.—The Phœbe St. School, it is reported, has been destroyed by fire.

STREET CLEANING AND GARBAGE DISPOSAL.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—Press reports state that a proposition is to be submitted to the City Council to purchase a city garbage farm and install a new garbage system, under city control.

Des Moines, Ia.—The Council Com., consisting of Aldermen Higgins, Fraley and Whitney, which inspected the garbage disposal system at Minneapolis, has agreed that a municipal garbage plant is necessary for Des Moines

Rochester, N. Y.—Mayor Cutler, in his annual message, recommends the more sanitary disposal of garbage and the sanitary disposal of the city sewage now emptying into the Genesee River.

NEW INDUSTRIAL PLANTS.

The Wm. Tinkham Co., Harrisville, R. I., contemplates building a 3-story, 160x54-ft. worsted mill and installing a 300-h.p. power plant.

The Coosa Pipe & Foundry Co., Gadsden, Ala., will erect a soil pipe plant with 10,000 tons capacity annually. The power plant will consist of two 75-h.p. boilers and a 100-h.p. engine to drive blower and shafting. This part of the plant has not yet been ordered. M. W. Bush, Gen. Mgr.

The Cunningham Commission Co., Little Rock, Ark., will rebuild its mill, which was recently burned. The capacity of the engine and boiler will be about 200-h.p.

The Neely Mfg. Co., Yorkville, S. C., will erect a 75x225 ft. cotton mill, with engine and boiler room 50 ft. square. The capacity of the steam power plant, which has not been ordered, will be 200 h.p. Thos. P. Moore, Pres.

Newlee & Hunter, Pulaski, Va., will start a steam laundry about Mar. 1, in which $3,000 to $5,000 will be invested.

The Menasha, Wis., Paper Co. will erect a mill at Ladysmith, Wis. The specifications for the building have not yet been completed. The power plant will include 350 h.p. steam power, and water power of about the same capacity.

The Fearless Dishwasher Co., 79 South Ave., Rochester, N. Y., has let contract for a 60x164-ft. building and will install an 8 or 10-h.p. gasoline engine or electric motor.

C. S. Bucklin, 1815 Patapsco St., Baltimore, Md., representing the National Canning & Mfg. Co., writes that the company is erecting a 2-story 100x50-ft. building and will install a 75-h.p. boiler and a 20-h.p. engine, contracts for which have not yet been let. The company contemplates building other plants in various places.

The Kratzer Carriage Co., Des Moines, Ia., is planning to remodel one of its buildings the coming season, so it will be equal a building 133 ft. square, and will perhaps have three or four stories and a basement. A boiler and perhaps a 50-h.p. engine and a steam heating plant will be installed.

The Cape Fear Mfg. Co., Greensboro, N. C., whose plant was recently burned, has bought a cotton mill building near the city and will install a 125-h.p. boiler, a 100-h.p. engine and a full line of sash, door and blind machinery, contracts for which have not yet been placed.

Jas. H. Neil, Shelbyville, Tenn., writes that the Duck River Valley Canning Co. has been organized to establish a canning factory of 15,000 to 20,000 capacity.

The Allyne Brass Foundry Co., Cleveland, O., has let contract for a 155x80-ft. foundry in Detroit, and will install emery wheels, tumbling mill and a small motor.

Calvert & Leek, Ogden, Utah, brickmakers, contractors and builders, will erect a building about 30x50 ft. and install a 75-h.p. alternating current motor.

The Jordan Mfg. Co., Wellford, S. C., will erect a building about 50x120 ft. in size. Electricity generated from water power will be used.

Aug. Andrae, Easton, Pa., contemplates establishing a silk mill in Petersburg, Va. He will probably use a building now standing, and ultimately use electric power developed on the Appomatox River.

The Orinoka Mills, Ruth & Somerset Sts., Philadelphia, Pa., will erect a new plant, but plans have not yet been completed.

The Dana Mfg. Co., Cincinnati, O., has purchased nearly five acres in Norwood, and expects this spring to build a factory. There will be several buildings, a foundry for making light gray iron castings such as used in freezers, a galvanizing and tinning plant, a wood-working shop and drying rooms for making tubs, a can shop and a warehouse. These will be in separate buildings and will cover about 50,000 sq. ft. of floor space.

The Galion, O., Metallic Vault Co. will erect a factory as soon as the weather is favorable, and will require punch, shears, bending rolls, drill presses, blower, bolt cutter, gas engine, etc. Thos F. Kelly is interested.

The Wolverine Motor Works, 128 So. Front St., Grand Rapids, Mich., contemplate erecting a new plant, but plans have not been completed.

MISCELLANEOUS.

Notes Arranged Alphabetically by States.

Los Angeles, Cal.—Bids will be received at the office of the U. S. Reclamation Service, 1108 Braly Bldg., Los Angeles, on Mar. 15 (not May 15, as previously stated), for the construction of Laguna dam and sluice ways, involving the excavation of 282,000 cu. yd. earth, 305,000 cu. yd. solid rock, placing 305,000 cu. yd. rock in dam and masonry core walls, building 27,150 cu. yd. concrete, laying 80,000 sq. yd. paving and 53,000 lin. ft. sheet piling for diversion of part of Colorado River, 10 miles n. e. of Yuma, Ariz., as advertised in The Engineering Record.

Items marked thus give the names of parties awarded contracts.

San Francisco, Cal.—The following are the bids opened on Jan. 14 by the Bureau of Yards and Docks, Navy Dept., Washington, D. C., for a longitudinal dike at the navy yard—*a*, price per lin. ft. for dike, based on a length of 2,000 ft.; *b*, price per lin. ft. for construction of 500 ft. additional; *c*, price per lin. ft. of round piles to govern any increased length of piling; *d*, price per M. ft. for lumber worked into place; *e*, price per lb. metal worked into place: W. N. Concannon, 205-207 Crossley Bldg., San Francisco, *a*, $42.95; *b* $43.40; *c*, 18 cts.; *d*, $30; *e*, 5 cts. Cotton Bros. & Co., Bacon Bldg., Oakland, *a*, $43.40; *b*, $42.90; *c*, 23 cts.; *d*, $49; *e*, 5½ cts. Burrell Constr. Co., Central Bldg., Oakland, *a*, $43.37; *b*, $41; *c*, 37 cts.; *d*, $27; *c*, 4 cts. Healy, Tibbitts & Co., 22 Market St., San Francisco, *a*, $36.90; *b*, $36.90; *c*, 29 cts.; *d*, $44; *e*, 9 cts. Thomson Bridge Co., 129 Mission St., San Francisco, *a*, $41.13; *b*, $41.13; *c*, 30 cts.; *d*, $34.75; *e*, 5 cts. City Street Improv. Co., 512 Mills Bldg., San Francisco, *a*, $38.88; *b*, $38.88; *c*, 19½ cts.; *d*, $38; *e*, 9 cts. Dundon Bridge & Constr. Co., 225 Folsom St., San Francisco, *a*, $41.25; *b*, $41.10; *c*, 30 cts.; *d*, $50; *e*, 8 cts.

Colorado Springs, Colo.—The Mine Owners' Assoc. are reported to be considering the construction of a deeper drainage tunnel in the Cripple Creek Dist.

Washington, D. C.—Bids will be received Feb. 7, at the Bureau Supplies and Accounts, Navy Dept., Washington, for furnishing at navy yards, Portsmouth, N. H., Boston, Mass., New York, N. Y., League Island, Pa., Norfolk, Va., and Pensacola, Fla., a quantity of machine tools, consisting of engine, lathe, dredging pump, locomotive boiler, self-oiling engine, swinging engine, water heater, engine lathe, speed lathe, metal planer, pipe expanding machine, pipe bender, hydraulic furnace, etc.; bids will also be received Feb. 14, for furnishing at navy yards, Mare Island, Cal. and Puget Sound, Wash., a quantity of sewer and water pipe, and fittings, iron, steel, copper pipe, McKellar steam trap, spare parts for Dow pumps, pumps, water filters, electric wire, pipe straps, conduit and couplings, etc.; also for furnishing pneumatic drill and boring machine, filing machine, radial drill press, electric forge, sheet metal. etc. H. T. B. Harris, Paymaster Gen., U. S. N.

Chicago, Ill.—Bids will be received on Feb. 15, by the Bd. of Trus. of the Sanitary Dist. of Chicago (Zina R. Carter, Pres.) for dredging the Main Chicago River at south branch of Chicago River, and docking portions, together with other work collateral thereto, as advertised in The Engineering Record.

*The Otis Elevator Co., of New York, N. Y., has secured the contract for 5 additional mail lifts at the U. S. Post Office, for $14,130.

Pana, Ill.—A. B. Alexander, Engr., 154 S. Water St., Decatur, writes that the following are the bids opened on Jan. 14 by the Comrs. of Pana and Assumption Drainage Dist. for dredging about 4 miles of main ditch, about 26,250 cu. yd. (price given per cu. yd.): C. F. Adams, Pana, 20 cts.; R. H. McWilliams, Mattoon, 23¾ cts.; Jos. Lewis, Attwood, 25½ cts.; A. J. Kleutscky, Prairie Plains, 27½ cts.; Gus Wilson, Pana, 28 cts. All these bids were rejected as being too high, and the Comrs. have decided to lay tile in the old ditch instead of dredging. Bids will be received by J. A. Foil, Town Clk., on Feb. 11 for the tile work required, as follows: 5,000 ft. 15-in., 5,700 ft. 14-in., 8,700 ft. 12-in., and 3,900 ft. 10-in.

Leavenworth, Kan.—The Leavenworth & Topeka Ry. (C. T. McLellan, Pres., Topeka), the Santa Fe R. R. (W. B. Storey, Ch. Engr., Topeka), and the Chicago, Great Western R. R. (A. Munster, Ch. Engr., St. Paul, Minn.) are reported to have partially consented to a plan to increase the size and width of the culverts along the course of Three Mile Creek, to broaden and straighten the bed of the waterway, to repair the sides and secure them against crumbling, and to build a satisfactory bridge in place of the present trestlework, removing the piles from the bed of the creek as far as possible. City Engr. Jones is reported to have completed plans for the work.

**New Orleans, La.*—The State Bd. of Engrs. is reported to have awarded to Donovan & Daley the contract for 108,000 cu. yds. of enlargement of the Melville Levee, in East Carroll Parish, 5th Louisiana Levee Dist., at 7.45 cts. per cu. yd.

Bids will be received on Feb. 6, by the Bd. Comrs., Orleans Levee Dist., Rm. 15 Masonic Temple, for $50,000 bonds. T. J. Duggan, Secy.

Baton Rouge, La.—Permanent improvement bonds amounting to $240,000 have been sold by the City Council. R. Swart, City Engr.

Ft. McKinley, Me.—Bids will be received by Capt. A. W. Yates, Q. M. U. S. A., Portland, on Feb. 15, for furnishing and installing steam pump in pump house at Ft. McKinley, as advertised in The Engineering Record.

Boston, Mass.—Bids will be received Feb. 11 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for constructing 2 crane runways in the steam engineering foundry at navy yard here.

Bids will be received Jan. 26 by B. Leighton Beal, Secy. Boston Transit Comn., 15 Beacon St., for furnishing and delivering about 440 tons structural steel for section 4 of Washington St. tunnel.

Detroit, Mich.—Bids will be received by Lieut.-Col. Chas. E. L. B. Davis, Corps Engr., U. S. A., Jones Bldg., on Feb. 16, for dredging in lower Detroit River, as advertised in The Engineering Record.

St. Louis, Mo.—Bids will be received by Capt. Wm. B. Ladue, Corps Engrs. U. S. A., Secy. Mississippi River Comn., on Mar. 17, for construction and delivery of self-propelling hydraulic dredge and ponton pipe line, as advertised in The Engineering Record.

Omaha, Neb.—Bids are wanted Feb. 6 for constructing retaining wall, grading, and roadway, etc., at quartermaster's depot here. Address Maj. M. Gray Zalinski, Acting Ch. Q. M.

Portsmouth, N. H.—Bids will be received Feb. 11 by Mordecai T. Endicott, Ch. Bureau Yards and Docks, Navy Dept., Washington, D. C., for furnishing and installing an electric elevator at navy yard here.

Holly Beach, N. J.—Press reports state that the Boro. Council will issue $25,000 bonds for the construction of a beach front boardwalk.

Roswell, N. M.—The following are the bids opened at the office of the Chief Engineer of the Reclamation Service, U. S. Geological Survey, Washington, D. C., on Jan. 10, for about 2,000 bbls. Portland cement, to be delivered at Roswell, for use in connection with the construction of the Hondo project: Western Cement Selling Co., Denver, Colo., "Ideal," $2.95 per bbl.; "Iola," $2.83 per bbl. Atlas Portland Cement Co., New York, N. Y., in bbls., $3.39 per bbl.; in duck bags, $2.99 per bbl. Portland Cement Co., Denver, Colo., $2.95 per bbl.

Syracuse, N. Y.—Bids are wanted Jan. 24 for $198,000 local improvement bonds. E. J. Mack, City Compt.

New York, N. Y.—Bids will be received Jan. 26, by Maurice Featherson, Comr. of Docks, for furnishing and delivering about 10,000 bbls. Portland cement.

Buffalo, N. Y.—Bids will be receivedd Jan. 24 by the Dept. Pub. Wks. for furnishing material and constructing a crib and placing same in front of inlet pier, near middle of Niagara River, opposite Water Wks. at Massachusetts Ave. Francis G. Ward, Comr.

Fernbank, O.—Bids will be received by Lieut. Col. E. H. Ruffner, Corps Engrs. U. S. A., Cincinnati, on Feb. 21, for furnishing about 34,000 bbl. of American Portland cement at Fernbank, as advertised in The Engineering Record.

Cleveland, O.—Bids will be received Feb. 11 by the State Bd. Pub. Wks. at Columbus, for furnishing material and improving Northern division of Ohio and Erie Canal, commencing at Cleveland; work to include the following: 5,000 bbls. Portland cement, 42 sets lock-gates complete, 500 ft. 30-in. sewer pipe, 300 M. ft. hardwood plank and timber, 3 steel or combination aqueducts, relaying lock walls and other walls, etc., as advertised in The Engineering Record.

Nashville, Tenn.—Bids will be received Feb. 4, by Jas. Knox Taylor, Superv. Archt., Treas. Dept., Washington, D. C., for installing an electric passenger elevator in U. S. Post Office here.

Galveston, Tex.—The War Dept. is stated to have approved plans and specifications for the first lock to be constructed in Trinity River near Liberty, and bids will soon be asked by Capt. Edgar Jadwin, Corps Engr., U. S. A., at Galveston; the work will cost about $250,000.

Norfolk, Va.—Capt. E. Eveleth Winslow, Corps Engrs. U. S. A., writes that the following are the bids opened on Jan. 9 for dredging Norfolk Harbor, 400,000 cu. yds. (price given per cu. yd.): Morris & Cummings Dredging Co., New York, N. Y., 10 cts.; P. Sanford Ross, Inc., Jersey City, N. J., 18 cts.; Columbia Dredging Co., New York, N. Y., 8.9 cts.; Maryland Dredging Co., Baltimore, Md., 8 cts.; Coastwise Dredging Co., Norfolk, 7.7 cts.; Norfolk Dredging Co., Norfolk, Va., 7.9 cts.

Casper, Wyo.—The following are the bids opened on Jan. 9 by the U. S. Geological Survey, Dept. of Interior, Washington, D. C., for construction of outlet tunnel, and two vertical shafts, to serve as a diversion tunnel for Pathfinder Dam, about 50 miles southwest of Casper, on North Platte River;—(*a*) McDonough & Meehan, Chicago, Ill., total bid, $77,040; (*b*) Faris-Kesl Constr. Co., Ltd., Boise, Idaho, $37,652; (*c*) Kilpatrick Bros. & Collins Contr. Co., Beatrice, Neb., $34,292; (*d*) Streeter & Lusk, Denver, Colo,. $50,060:

	a.	*b.*	*c.*	*d.*
1,000 cu. yd. solid rock..	$2.00	$2.00	$1.25	$1.25
2,500 " loose matrl	1.00	1.00	.60	.60
480 lin. ft. tunnel ...	49.00	45.00	38.00	57.00
350 " shafts ...	140.00	33.00	38.00	57.00
100 cu. yd. overhaul†	.20	.02	.025	...

†Per 100 ft.

Panama.—Bids will be received by the Isthmian Canal Comn. (J. G. Walker, Chmn.), at Washington, D. C., on Feb. 7, for furnishing machine tools, machinery, hand cars, plumbers' supplies, etc., as advertised in The Engineering Record.

Grondines, Que.—It is stated that bids will be received Jan. 27 by Fred Gelinas, Secy. Dept. Pub. Wks., Ottawa, Ont., for enlarging wharf here.

PROPOSALS OPEN.

For proposals see pages 26, 28, 30.

Bids Close.	WATER WORKS.	See Eng. Record.
Jan. 23.	Louisburg, N. C., Adv. Jan. 7.	Jan. 7
Jan. 24.	Wells, North Ft. Worth, Tex	Jan. 21
Jan. 24.	Well, Dallas, Tex,..........	Jan. 7
Jan. 25.	Oxford, N.C., Adv. Jan. 14, 21.	Jan. 14
Jan. 25.	Supplies, New York, N. Y...	Jan. 14
Jan. 25.	Castings, Brooklyn, N. Y....	Jan. 14
Jan. 25.	Deadwood, S. D.............. Adv. Nov. 26 to Jan. 14.	Dec. 17
Jan. 28.	Boiler and tank, Ft. Logan. Logan, Colo.	Jan. 14
Jan. 28.	Phoenix, Ariz	Jan. 7
Feb. 1.	Mains, Brooklyn, N. Y.......	Jan. 21
Feb. 1.	Hydrants, etc., Brooklyn, N.Y.	Jan. 14
Feb. 1.	**Princeton, Ky. ....**	**Dec. 10**
Feb. 1.	**Pipe, San Francisco, Cal.....**	**Dec. 3**
Feb. 2.	Machinery, etc., Philadelphia, Pa., Adv. Jan. 21..........	Jan. 21
Feb. 6.	Pump, etc., Jacksonville, Fla.	Jan. 14
Feb. 7.	Ellisville, Miss.	Jan. 21
Feb. 7.	Christman, Ill., Adv. Jan. 21.	Jan. 14
Feb. 8.	Pipe, South Bend, Ind......	Jan. 14
Feb. 9.	Ft. Keogh, Mont.	Jan. 21
Feb. 10.	Bishop, Cal. .... Adv. Dec. 10 to 24.	Dec. 10
Feb. 11.	Main, Norwood, O.	—Jan. 21
Feb. 23.	Tilamook, Ore.	Jan. 14
Mar. 31.	Meters, Pocatello, Idaho....	Jan. 14
Mar. —.	Smith's Grove, Ky..........	Jan. 7
Apr. 1.	Irrig., Usk, Wash..........	Dec. 24
———	Pipe, Auburn, Me.	Jan. 14

SEWERAGE AND SEWAGE DISPOSAL.

Jan. 23.	St. Paul, Minn.	Jan. 21
Jan. 23.	Bay City, Mich.	Jan. 21
Jan. 23.	Louisburg, N.C., Adv. Jan. 7..	Jan. 7
Jan. 24.	New York, N. Y.	Jan. 21
Jan. 25.	Buffalo, N. Y.	Jan. 21
Jan. 26.	Cincinnati, O.	Jan. 21
Jan. 26.	Coldwater, Mich.	Jan. 7
Jan. 30.	Lansing, Mich.	Jan. 21
Jan. 30.	Washington, D. C.......... Adv. Jan. 14.	Jan. 14
Feb. 1.	Palatka, Fla., Adv. Jan. 14, 21.	Jan. 14
Feb. 1.	Cresco, Ia.	Dec. 31
Feb. 3.	St. Bernard, O.	Jan. 21
Feb. 4.	Fort. Michie, N. Y..........	Jan. 14
Feb. 6.	Washington, D. C.......... Adv. Jan. 14.	Jan. 14
Feb. 6.	Topeka, Kan.	Jan. 14
Feb. 7.	Los Angeles, Cal.	Jan. 7
Feb. 10.	Bishop, Cal. .... Adv. Dec. 10 to 24.	Dec. 10
Feb. 15.	Havana, Ill. .... Adv. Jan. 14, 21.	Jan. 14
Feb. 15.	New Rochelle, N. Y.........	Jan. 21
Feb. 15.	Linenburg, N. S.	Jan. 14
Feb. 16.	St. Bernard, O.	Jan. 21

BRIDGES.

Jan. 24.	Boston, Mass.	Jan. 21
Jan. 31.	Des Moines, Ia.	Jan. 21
Feb. 2.	Helena, Mont.	Jan. 21
Feb. 6.	Topeka, Kan.	Jan. 14
Feb. 6.	Santa Barbara, Cal.........	Jan. 7
Feb. 7.	Indianapolis, Ind...........	Jan. 21
Feb. 7.	Binghamton, N. Y.	Jan. 21
Feb. 7.	Stockton, Cal.	Jan. 21
Feb. 7.	Muscatine, Ia.	Jan. 14
Feb. 7.	Wabash, Ind.	Jan. 14
Feb. 8.	Vincennes, Ind.	Jan. 21
Feb. 13.	Sherbrooke, N. D.	Jan. 21
Feb. 14.	Napa, Cal.	Dec. 31
Feb. 16.	Columbus, O.	Jan. 21
Feb. 16.	Charleston, W. Va.......... Adv. Jan. 21.	Jan. 21
Peb. 17.	Port Clinton, O.	Jan. 21
Feb. 20.	Culpeper, Va.	Jan. 21

PAVING AND ROADMAKING.

Jan. 23.	Jersey City, N. J.	Jan. 21
Jan. 24.	New York, N. Y............	Jan. 21
Jan. 25.	Baltimore, Md.............	Jan. 21
Jan. 25.	Cincinnati, O.	Jan. 21
Jan. 25.	Buffalo, N. Y..............	Jan. 21
Jan. 25.	Cleveland, O.	Jan. 14
Jan. 26.	Toledo, O.	Jan. 21
Jan. 26.	Cortland, N.Y., Adv. Jan. 14.	Jan. 14
Jan. 27.	St. Louis, Mo.	Jan. 14
Jan. 31.	**Ebensburg, Pa. ....**	**Jan. 7**
Feb. 1.	Buffalo, N. Y.	Jan. 21
Feb. 1.	Cleveland, O.	Jan. 21
Feb. 1.	Brooklyn, N. Y.	Jan. 21
Feb. 1.	Cincinnati, O.	Jan. 14
Feb. 2.	Cincinnati, O.	Jan. 14
Feb. 4.	Sharon, Conn.	Jan. 21
Feb. 4.	Bay City, Mich.	Jan. 21
Feb. 6.	Topeka, Kan.	Jan. 14
Feb. 6.	Webb City, Mo., Adv. Jan. 7..	Jan. 7
Feb. 7.	Broad Ripple, Ind.	Jan. 21
Feb. 7.	Franklin, Ind.	Jan. 21
Feb. 7.	Rensselaer, Ind.	Dec. 31
Feb. 9.	Port Townsend, Wash......	Jan. 21
Feb. 14.	**Napa, Cal. ....**	**Dec. 31**
Feb. 15.	Madison, Wis.	Jan. 21
Feb. 18.	Washington, D. C. .... Adv. Jan. 21.	Jan. 21

POWER, GAS AND ELECTRICITY.

Jan. 24.	Washington, D. C.	Jan. 14
Jan. 24.	Riverside, Cal.	Jan. 7
Jan. 24.	**Newport, R. I. ....**	**Dec. 31**
Jan. 25.	Toledo, O.	Jan. 21
Jan. 25.	Oxford, N.C., Adv. Jan. 14, 21.	Jan. 14
Jan. 28.	**Ft. D. A. Russell, Wyo. .....** Adv. Dec. 31 to Jan. 21.	**Dec. 31**
Jan. 31.	**Ft. Walla Walla, Wash. ...**	**Jan. 7**
Feb. 1.	Ann Arbor, Mich.	Jan. 21
Feb. 2.	Lakewood, O.	Jan. 14
Feb. 2.	Columbus, Ind.	Jan. 14
Feb. 3.	Atlantic City, N. J......... Adv. Jan. 21.	Jan. 21
Feb. 15.	Cleveland, O.	Jan. 21
Feb. 15.	Temple, Tex.	Jan. 21
Feb. 15.	Chicago, Ill................	Dec. 24
Apr. —.	Ft. Valley, Ga.	Jan. 21

BUILDINGS.

Jan. 23.	School, New York, N. Y.....	Jan. 14
Jan. 23.	School, Brooklyn, N. Y......	Jan. 14
Jan. 24.	School, Galena, Ill..........	Jan. 7
Jan. 25.	School, Boston, Mass.......	Jan. 21
Jan. 25.	Post Bldg., Ft. Wayne, Detroit, Mich., Adv. Jan. 14, 21.	Jan. 14
Jan. 25.	**P. O. Bldg., Washington, Pa.. Adv. Dec. 3, 10.**	**Dec. 3**
Jan. 26.	Police headquarters, New York N. Y.	Jan. 21
Jan. 26.	School, Ames, Ia...........	Jan. 14
Jan. 26.	**School, Ft. Mojave, Ariz....**	**Jan. 7**
Jan. 26.	Moving Univ. Bldg., Iowa City, Ia., Adv. Jan. 7 and 14..	Jan. 7
Jan. 27.	Storage Bldg., Jeffersonville, Ind.	Jan. 14
Jan. 27.	Htg. Pub. Bldg., Los Angeles, Cal.	Jan. 14
Jan. 28.	Bus. Bldg., Baltimore, Md...	Jan. 21
Jan. 28.	Police Station, Newburg Heights, O.	Dec. 31
Jan. 30.	School, New York, N. Y.....	Jan. 21
Jan. 30.	School, Brooklyn, N. Y.	Jan. 21
Jan. 30.	School, Grand Forks, N. D..	Jan. 21
Jan. 30.	Pub. Bldgs., Ft. Crook, Neb.	Jan. 14
Jan. 30.	School, Webster, N. D......	Jan. 7
Jan. 30.	P. O. Bldg., Dekalb, Ill....	Jan. 7
Jan. 31.	Flat, Bayonne, N. J.........	Jan. 14
Jan. 31.	Pub. Bldg., Ft. Moultrie, S. C.	Jan. 7
Jan. 31.	**P. O. Bldg., Albert Lea, Minn. ....**	**Dec. 10**
Jan. —.	**Public Bldg., Des Moines, Ia..**	**Dec. 3**
Feb. 1.	School, Oakland, Cal.	Jan. 21
Feb. 1.	Asylum, Knoxville, Ia.	Jan. 21
Feb. 1.	Church, Montezuma, O.	Jan. 14
Feb. 1.	Arsenal and armory, Hartford, Conn., Adv. Jan. 21...........	Jan. 14
Feb. 1.	P. O. Bldg., Ogden, Utah.... Adv. Dec. 31.	Dec. 31
Feb. 1.	Church, Zanesville, O.	Dec. 31
Feb. 1.	Court House, Goshen, Ind. ..	Dec. 31
Feb. 1.	Court House, Elkhart, Ind....	Dec. 3
Feb. 2.	Htg. Alms House, Lockport, N. Y.	Jan. 21
Feb. 2.	Htg. P.O. Bldg., Atlantic City, N. J., Adv. Jan. 14, 21.....	Jan. 14
Feb. 4.	Church, Philadelphia, Pa. ...	Jan. 21
Feb. 4.	Coal testing plant, Roselyn, Va.	Jan. 21
Feb. 4.	School, Canandaigua, N. Y...	Jan. 14
Feb. 6.	School, Shreveport, La.......	Jan. 21
Feb. 6.	Court House, Ocala, Fla....	Jan. 14
Feb. 6.	Htg. Post Bldg., Ft. Mott, N. J., Adv. Jan. 14, 21......	Jan. 14
Feb. 7.	Court House, Hillsboro, N. D.	Jan. 21
Feb. 7.	Armory, Flushing, N. Y. .... Adv. Jan. 21.	Jan. 21
Feb. 7.	School, Philadelphia, Pa......	Jan. 21
Feb. 7.	Court House, Monticello, Miss.	Jan. 21
Feb. 7.	School, Lac du Flambeau, Wis.	Jan. 14
Feb. 7.	P. O. Bldg., Nevada, Mo.....	Dec. 31
Feb. 8.	Masonic Temple, Watertown, Wis.	Jan. 21
Feb. 8.	School, Bolivar, N. Y........	Jan. 14
Feb. 8.	School, Halstad, Minn.......	Jan. 14
Feb. 9.	Jail, New Albany, Miss.	Jan. 21
Feb. 9.	Post Bldg., Plattsburg Barracks, N.Y., Adv. Jan. 14, 21..	Jan. 14
Feb. 9.	Post Bldg., Tompkinsville, S. I., N. Y., Adv. Jan. 14, 21...	Jan. 14
Feb. 9.	P. O. Bldg., Natchez, Miss.. Adv. Jan. 7 and 14.	Jan. 7
Feb. 10.	School, Helena, Okla. Ter...	Jan. 21
Feb. 10.	Post Bldg., Ft. Howard, Md..	Jan. 21
Feb. 11.	Post Bldg., Chickamauga Park, Ga., Adv. Jan. 21	Jan. 14
Feb. 13.	Post Bldgs., Point Bonita, Cal. Adv. Jan. 21.	Jan. 21
Feb. 13.	Court House, Carlton, Minn..	Jan. 21
Feb. 14.	Armory, Binghamton, N. Y.. Adv. Jan. 21.	Jan. 21
Feb. 14.	Htg. P. O. Bldg., Batesville, Ark., Adv. Jan. 14, 21.......	Jan. 14
Feb. 15.	Post Bldg., Ft. Wright, Wash..	Jan. 21
Feb. 15.	School, Talklai, Ariz.	Jan. 21
Feb. 15.	Church, Flandreau, S. D.....	Jan. 21
Feb. 15.	Htg. P. O., Chillicothe, O. ...	Jan. 14
Feb. 21.	Univ. Bldg., Washington, D.C.	Jan. 21
Feb. 21.	P. O. Bldg., Westchester, Pa. Adv. Dec. 31 to Jan. 7.	Dec. 31
Feb. 23.	P. O. Bldg., Decatur, Ill. .... Adv. Jan. 14, 21.	Jan. 14
Feb. 27.	P. O. Bldg., Columbia, Mo....	Jan. 21
Feb. 28.	P. O. Bldg., Louisiana, Mo...	Jan. 21
Feb. —.	Hospital, Albany, N. Y.....	Dec. 24
Mar. 6.	P. O. Bldg., Battle Creek, Mich., Adv. Jan. 21	Jan. 21
Mar. 6.	Court House, Sardis, Miss...	Dec. 17
Mar. —.	Court House, Greenwood, Miss.	Jan. 21
Apr. 5.	**Court House plans, New Orleans, La. ....**	**Dec. 3**

MISCELLANEOUS.

Jan. 24.	Crib, Buffalo, N. Y.	Jan. 21
Jan. 24.	Levee work, New Orleans, La. Adv. Jan. 14, 21.	Jan. 14
Jan. 24.	Iron, New York, N. Y.......	Jan. 14
Jan. 24.	**Piles, Panama ....**	**Dec. 31**
Jan. 25.	Ditch, Rensselaer, Ind......	Jan. 14
Jan. 26.	Steel, Boston, Mass.	Jan. 21
Jan. 26.	Cement, New York, New York.	Jan. 21
Jan. 26.	Breakwater, Toronto, Ont....	Jan. 7
Jan. 27.	Wharf, Grondines, Que.	Jan. 21
Jan. 28.	**Draft plant, West Point, N. Y., Adv. Jan. 7 to 21.......**	**Jan. 7**
Jan. 29.	Ditch, Wabash, Ind.	Jan. 14
Jan. 31.	Jetty, Portland, Ore.......	Jan. 7
Feb. 1.	Stripping, St. Clair, Pa..... Adv. Jan. 14, 21.	Jan. 14
Feb. 1.	**R. R. work, Sonoma, Cal. ..**	**Dec. 24**
Feb. 3.	Piles, San Francisco, Cal..... Adv. Jan. 14, 21.	Jan. 14
Feb. 3.	**Dredging, Savannah, Ga....** Adv. Jan. 7 to 21.	**Jan. 7**
Feb. 4.	Elevator, Nashville, Tenn....	Jan. 21
Feb. 4.	Industrial Plant, Philadelphia, Pa.	Jan. 7
Feb. 4.	Dredging, Chicago, Ill...... Adv. Jan. 7 to 21.	Jan. 7
Feb. 6.	Retaining wall, etc., Omaha, Neb.	Jan. 21
Feb. 6.	El. Ry. franchise, Los Angeles, Cal.	Jan. 21
Feb. 7.	Supplies, Washington, D. C..	Jan. 21
Feb. 7.	Tools, Machry, etc., Panama.. Adv. Jan. 14, 21.	Jan. 21
Feb. 7.	Supplies, Philadelphia, Pa....	Jan. 14
Feb. 7.	Wharf, Ft. Totten, Willets Point, N. Y., Adv. Jan. 14, 21.	Jan. 14
Feb. 7.	Bldg. supplies, Chicago, Ill..	Jan. 14
Feb. 8.	**Dam, etc., Phoenix, Ariz..... Adv. Dec. 3 to 24.**	**Dec. 3**
Feb. 11.	Canal work, Cleveland, O.... Adv. Jan. 21.	Jan. 21
Feb. 11.	Tile work, Pana, Ill.........	Jan. 21
Feb. 11.	Electric Elevator, Portsmouth N. H.	Jan. 21
Feb. 11.	Crane runways, Boston, Mass.	Jan. 21
Feb. 11.	Supplies, Washington, D. C..	Jan. 21
Feb. 15.	Steam pump, Ft. McKinley Me. Adv. Jan. 21.	Jan. 21
Feb. 15.	Dredging, Chicago, Ill. ...... Adv. Jan. 21.	Jan. 21
Mar. 15.	Dam, etc., Los Angeles, Cal.. Adv. Jan. 14, 21.	Jan. 14
Feb. 16.	Dredging, Detroit, Mich.... Adv. Jan. 21.	Jan. 21
Feb. 21.	Cement, Fernbank, O........ Adv. Jan. 21.	Jan. 21
Feb. 23.	El. Ry. franchise, San Diego, Cal.	Jan. 21
Mar. 17.	Dredge, etc., St. Louis, Mo.. Adv. Jan. 21.	Jan. 21
Mar. 31.	**El. Ry., Shanghai, China....**	**Oct, 22**

**Items marked thus give the names of parties awarded contracts.*